COMBINED CATALOG

Northeastern University

COLLEGE OF LIBERAL ARTS
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COLLEGE OF BUSINESS ADMINISTRATION
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GRADUATE SCHOOLS
of
Arts and Sciences
Actuarial Science
Business Administration
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Education
Engineering

NORTHEASTERN UNIVERSITY

EDUCATION
LIBERAL ARTS
ENGINEERING
BUSINESS ADMINISTRATION
PHARMACY
NURSING

1964 - 1965 CATALOG

NORTHEASTERN UNIVERSITY

LVX
VERITAS
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FOUNDED A.D. 1898

BOSTON, MASSACHUSETTS

TABLE OF CONTENTS

1964-1965

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A
Pictorial
Visit

PLAN OF
NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS

LEGEND

■ Campus Buildings

1. Women's Dormitory
2. Men's Dormitory
3. Women's Dormitory
4. Greenleaf Building
5. Forsyth Building
6. Graduate Center
7. Cabot Physical Education Center
8. Richards Hall
9. Hayden Hall
10. Ell Student Center Building
11. Alumni Auditorium
12. Mugar Life Sciences Building
13. Dodge Library
14. Botolph Building
15. United Realty Building
16. Speare Hall
17. Fenway Dormitory
18. Men's Apartments
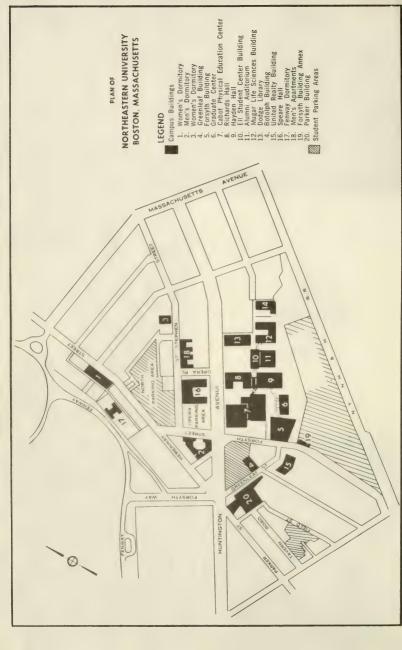19. Forsyth Building Annex
20. Parker Building

▨ Student Parking Areas

The Governing Boards
and Officers
of the University

- The Corporation
- The Board of Trustees
- General University Committees
- Officers of Administration

6

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9

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10

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11

Aims and Scope
of the University

Founded in 1898, Northeastern University is incorporated as a privately endowed, nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than one hundred and twenty-five distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Co-operative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), and Nursing (1964). This time-tested educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, actuarial science, and the pharmaceutical sciences.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. These programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day but who are desirous of broadening their educational background by part-time study. All formal courses of study leading to degrees through evening programs are approved by the appropriate Basic College faculties and are subject to the same quantitative and qualitative standards as the regular day curricula.

Following is a brief outline of the aims and scope of the University's programs.

I. THE EIGHT COLLEGES

1. The College of Liberal Arts

The College of Liberal Arts offers majors in the usual fields of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of pre-professional programs, curricula are normally five years in length, being operated on the Co-operative Plan.

2. The College of Education

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Co-operative Plan, which provides for employment in libraries, social service agencies, and school systems.

3. The College of Business Administration

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business

Proposed Northeastern University Campus of Tomorrow

Administration. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate courses of study.

The College also sponsors a Center for Management Development which annually conducts an intensive program designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Co-operative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate co-operative students as research assistants.

4. The College of Engineering

The College of Engineering offers five-year co-operative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day co-operative curriculum, and meets the same qualitative and quantitative standards of scholarship.

5. The College of Pharmacy

The College of Pharmacy offers five-year co-operative curricula leading to the degree of Bachelor of Science in Pharmacy. Co-operative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

6. The College of Nursing

The College of Nursing offers a three-year program on the Co-operative Plan which qualifies students for the associate degree and prepares them for the R.N. Examinations. Three of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, and the Massachusetts General Hospital — collaborate with Northeastern University by providing suitable co-operative work opportunities during the second and third years of the program. Graduates of the three-year program may continue toward the Bachelor of Science degree if they so desire.

7. University College

University College, so called because it draws upon the resources of the other Colleges of the University, offers courses of study leading to certificates, asso-

ciate degrees, or to the Bachelor of Science degree. University College offers both day and evening programs; the latter are designed specifically to meet the needs of older, more mature students who wish to undertake part-time curricula during late afternoon or evening hours and on Saturday mornings. In co-operation with the Forsyth School for Dental Hygienists, University College also offers a two-year day curriculum leading to the Associate in Science degree.

Quality standards of instruction and requirements for the degrees offered by University College are wholly consistent with those of the other Colleges of the University. University College does not duplicate the offerings of the Colleges of Liberal Arts, Business Administration, Pharmacy, Education, Engineering and Nursing, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adults desiring formal programs of professional development on a part-time basis, or of young people enrolled in professional schools affiliated with Northeastern University.

8. Lincoln College

Lincoln College offers evening programs of study in several fields of science and engineering technology leading to the degree of Associate in Science or Associate in Engineering. The courses of study are of college grade and cover much of the technological subject matter customarily included in schools of engineering, but the curricula are less extensive in scope than those required for the baccalaureate degree in engineering. They prepare students to work with professional engineers in various technical capacities.

II. THE GRADUATE DIVISION

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

Arts and Sciences
Master of Arts, Master of Science, Ph.D. in Physics and in Chemistry

Business
Master of Business Administration

Education
Master of Education

Engineering
Master of Science with course specification, Ph.D. in the fields of Electrical and Chemical Engineering

Actuarial Science
Master of Science in Actuarial Science

Pharmaceutical Sciences
Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology

Some of these programs are offered on the Co-operative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in the Graduate Center Building.

III. CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. Through the Bureau of Business and Industrial Training, the Center provides in-service programs, custom-built to meet specific needs of business and industrial enterprises, while the Division of Special Programs, working co-operatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

IV. AFFILIATED PROGRAMS

1. For Dental Hygienists

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in co-operation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

2. For Medical Technologists

In co-operation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Co-operative Plan leading to the degree of Bachelor of Arts.

3. For Nurses

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the Peter Bent Brigham, New England Deaconess, and Children's Hospital Medical Center Schools of Nursing.

V. RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are co-ordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction in the areas of art and sciences, business, engineering, pharmacy, nursing, and teacher education, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

Buildings
and
Facilities

The campus of Northeastern University is located on Huntington Avenue near its junction with Massachusetts Avenue in the Back Bay section of Boston, an area in the western section of the city near the Fenway.

Many of Boston's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, The Isabella Stewart Gardner Museum, the Harvard Teaching Hospitals, and many schools and colleges both public and private.

Northeastern University's 42-acre campus is divided by Huntington Avenue, with the educational buildings on the south side and dormitories on the north.

The nine main educational buildings, all of which have been completed since 1938, are of glazed-brick construction in the contemporary classic style. They are interconnected with closed passageways so that students and faculty may move from building to building under shelter during the winter months.

Richards Hall, built in 1938, houses the main administrative offices of the University, contains some of the Chemistry laboratories and Mechanical Engineering laboratories and provides a number of classrooms and faculty offices.

The Mugar Life Sciences Building contains the College of Pharmacy, the College of Nursing, and the Departments of Psychology, Biology, and Chemical Engineering.

Centrally located where it is readily accessible to students from all of the Colleges and the Graduate Division is the Dodge Library, operated upon an

open-stack plan and equipped to serve effectively the needs of the varied student bodies which comprise the Northeastern community. The Dodge Library is an official depository for government publications and documents.

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of this building.

Hayden Hall provides the principal facilities of the College of Business Administration and the College of Education. Its ground floor is occupied by the Department of Electrical Engineering. Headquarters of University College and Lincoln College, as well as the Center for Continuing Education, are also located in Hayden Hall.

The Graduate Center Building contains the University's cafeteria on its ground floor, provides administrative headquarters for the Graduate Division, and houses the Department of Natural Sciences and Physics laboratories.

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the

GODFREY LOWELL CABOT
PHYSICAL EDUCATION CENTER
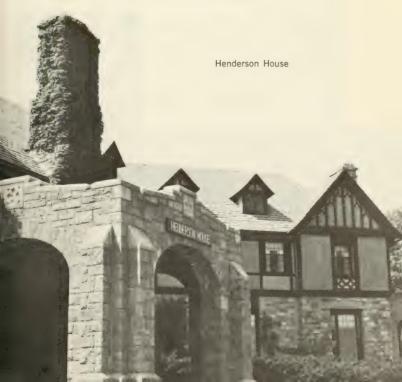
Department of Athletics and for the Physical Education Department of the College of Education.

Three other buildings on the campus have been completely remodeled and reconditioned for educational purposes. These are the Botolph Building, which houses the Department of Civil Engineering; the Forsyth Building, in which are located the University Health Service, some of the Mechanical Engineering laboratories, the facilities of the Department of Industrial Engineering, and the training areas of the ROTC; and the Greenleaf Building, now used for research and for purposes of the Department of Military Science.

Adjacent to the campus are extensive parking areas, capable of handling 1,500 automobiles.

Northeastern also operates five dormitories housing 750 men and 450 women, as well as an apartment building which accommodates 300 men. The University's newest dormitory is Speare Hall. This dormitory, which will accommodate 400 women, will be opened in time for freshmen entering in September of 1964.

Henderson House

How to Reach Northeastern University

The chief railroad centers of Boston are the North and South Stations. To reach the University from the North Station take an MTA car to Park Street and transfer there to any Huntington Avenue car.

To reach the University from the South Station, board a Cambridge-bound subway train and transfer at Park Street to any Huntington Avenue car. The "Northeastern" station is the first stop outside the subway.

Off-Campus Facilities

At Henderson House in Weston, Massachusetts, Northeastern University operates one of the nation's finest off-campus centers for continuing education. Adults enroll in short-term courses, seminars, and special institutes at Henderson House, which is 12 miles from the main campus on Huntington Avenue.
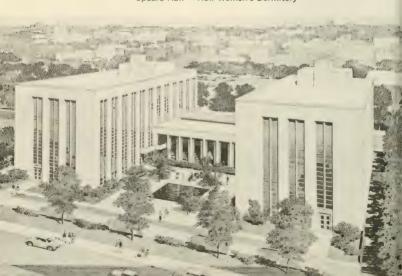
The University conducts some of its courses at a Suburban Campus near Route 128 in Burlington, Massachusetts, and Northeastern's Center for Management Development uses facilities on the campus of Phillips Academy in Andover, Massachusetts.

Athletic facilities for football and baseball are located at Kent Field, Kent Street, Brookline.

The Warren Center for Physical Education and Recreation, located in Ashland, Massachusetts, is being developed to serve the University's rapidly expanding programs in physical education.

Speare Hall — New Women's Dormitory

The Co-operative Plan

What It Is

The Co-operative Plan of Education is founded on the educational philosophy that supervised employment in the occupational field for which a student is training enhances comprehensive learning and vocational adaptation. It utilizes, in addition to the usual classroom and laboratory exercises, the learning situations of the workaday-world environment, thereby enabling the student to become acquainted with both theory and practice.

In 1960, the Study of Co-operative Education Committee, under the leadership of Dr. Ralph W. Tyler of the Center for Advanced Study in the Behavioral Sciences in California, completed a two-year, nation-wide analysis of Co-operative Education programs. The Committee reported that under this unique system of education the students find greater meaning in their studies, their motivation for academic pursuit is increased, they develop greater skills in human relations, their vocational guidance is improved, and through a reliance on their own judgments they achieve a maturity beyond their years.

The Co-operative Plan is particularly designed to serve the needs of the recent high school graduate rather than the older, more mature student, who already may have had considerable work experience.

All Northeastern co-operative curricula are five years in length to the baccalaureate degree. In the Colleges of Engineering, Business Administration, Liberal Arts, and Education, the program consists of a freshman year of three

21

consecutive ten-week terms of academic study, followed by four upper-class years on the Co-operative Plan.

In the College of Pharmacy only three upper-class years are on the Co-operative Plan, with the senior year being one of full-time study at the University.

In the College of Nursing the program covers three years leading to the associate degree. The first year consists of full-time study at the University followed by two years of alternating work and study under the Co-operative Plan.

How It Works

The Co-operative Plan works in the following manner. Upperclassmen, including both men and women, are divided into two nearly equal groups, one of which is called Division A and the other, Division B. Each student is assigned a job by his faculty co-ordinator. The Division A students start the college year with a term of classroom work, while the Division B students start the year with a term at co-operative work. At the end of the term, the Division A students go out to work with a co-operating firm, while their places in the classrooms are taken by their alternates, the corresponding Division B students.

When the next term has passed, the Division A students return to college, and the Division B students resume their co-operative work. The alternation of work and classroom study continues throughout the year so that each upperclassman has two terms of ten weeks and one of five weeks at college, two terms (one of ten weeks and one of sixteen weeks) at co-operative work, and a one-week vacation.

Each co-operating employer is thus assured of the continuous service of a pair of co-operative students alternating with each other throughout the calendar year. This assurance naturally tends to stabilize employment and encourages the co-operation of employers.

Faculty Co-ordinators

Each student is assigned to a co-ordinator, who is responsible for all phases of the Co-operative Education program for his group of students. He interviews them during the freshman year, discusses with them various vocational objectives, and answers questions regarding the many activities of business, industry, and the professions.

He studies them in the light of their physical condition, scholastic attainment, interests, aptitudes, and other factors bearing upon their qualifications for vocational assignment. These interviews culminate in an agreement between the student and his co-ordinator regarding the co-operative assignment on which the student will be placed.

During each of the terms at college immediately succeeding a term at co-operative work, the co-ordinator confers with the student concerning job experience and other matters relating to vocational adjustment or personal problems while on the job. In his reports the employer evaluates the achievement of the student. The faculty co-ordinator uses this information to guide the student toward his professional objective and to help him obtain maximum value from his education at Northeastern.

Placement

The co-ordinator visits co-operating firms and arranges for the employment of students in his charge. The range of opportunities for Northeastern students is wide, encompassing all the occupational fields for which they are preparing at the University. In general, the first year of co-operative work can be expected to be of a routine nature, testing fitness for more responsible work. A job assignment directly related to the student's field of study and consistent with his abilities, interests, and aptitudes, is the prime objective of the co-ordinator.

The jobs on which Northeastern students are employed are in no sense protected opportunities or purely observational assignments. They are regular jobs, performed under actual business conditions, and held in competition with other sources of supply, offering advancement on the basis of merit. The only privilege accorded Northeastern students is that of attending college on the Co-operative Plan.

Because of the uncertainties of the employment market, as well as other factors beyond its control, the University cannot and does not guarantee to place students. However, past experience has demonstrated that students who are willing and capable of adapting themselves to existing conditions are almost never without employment, except in periods of severe industrial depression.

Supervision and Guidance

While the University does not adopt a paternal attitude toward co-operative work, it nevertheless assumes certain responsibilities toward students and co-operating firms. Co-ordinators visit regularly each job to which students in their charge are assigned. They solicit from the employer an oral report upon the student's progress and achievement. This supplements the written evaluation sent to the co-ordinator at the close of each work term. Any adjustments that may seem necessary or advisable are arranged at this time. Progress on assignments, schedules of training, advancement, and transfers to new responsibilities are discussed and evaluated.

Through a series of written reports prepared during their working periods, students are led to analyze their jobs and to develop a thoughtful and investigative attitude toward their environment. A most important phase of co-operative work is the opportunity afforded for guidance by the frank discussion of actual problems encountered on the job. The personal contact between co-ordinator and student is of great value in helping the student to get the most from the co-operative work assignment. While the University endeavors to provide every possible opportunity for its students, it expects them at the same time to take the initiative and to assume the responsibility for their individual development. To every student are available the counsel and guidance of the faculty, and every resource at its disposal; but the faculty does not coerce students who are uninterested or unwilling to think for themselves.

The Co-operative Plan is thus designed specifically to provide actual working opportunities which afford the students practical experience, give meaning to their program of study, and train them in reliability, efficiency, and teamwork.

Location of Work

It is the policy of the University to assign students to co-operative jobs within commuting distance of their homes. This is not always possible, however, and at times it may be necessary for students to live away from home in order to obtain satisfactory and desirable co-operative work assignments.

Types of Co-operative Assignments

All types of employers are represented among the 1200 enterprises that employ Northeastern co-operative students. They include engineering firms, manufacturing companies, public utilities, government agencies, banks, railroads, insurance companies, wholesaling and retailing outlets, hospitals, social agencies, publishers, advertising houses, libraries, schools, and development and research organizations. Definite training schedules have been established with most of the co-operating employers. The ultimate objective of such schedules is absorption of the graduates into the permanent employ of the company, although such absorption is based on merit rather than guarantee.

Further details on the types of assignments available and the operation of the program are given in the booklet entitled "I'm a Co-op" published by the University. This booklet may be obtained from the Department of Admissions.

General Admissions
Information

Applicants for admission to the freshman class must qualify by graduation from an accredited secondary school and must earn the recommendation of their principal or guidance counselor for the particular program to which they have applied. The most important single factor among the credentials submitted to the Committee on Admissions is the candidate's record of achievement in high school or preparatory school.

Application for Admission

A combined Application for Admission and School Record form may be obtained by writing to the Department of Admissions, or may be secured at the time of the admissions interview at the University. Directions for the proper use of these forms appear on the blank. The Application for Admission should be filled out in ink, properly signed, and forwarded with a non-returnable ten-dollar fee to the Dean and Director of Admissions, Northeastern University, Boston 15, Massachusetts. Checks should be made payable to Northeastern University.

Admission Plan

Under the University's admission plan, candidates may be notified of their acceptance as soon as the Committee on Admissions has received sufficient evidence to indicate the likelihood of success in study at the University. Each candidate is dealt with individually, and a decision is made as promptly as possible as to his eligibility. Acceptances, therefore, may be issued early in the senior year, or after the College Board Aptitude Tests have been evaluated. Other candidates may necessarily wait until the results of Achievement Tests have been evaluated. The quality of the candidate's record through the junior year of high school and the schedule pattern of College Board testing dates have a direct bearing upon the candidate's acceptance date. In all cases, applicants for admission are required to complete successfully their senior year program of studies. Under this admission plan, the Committee on Admissions places greatest weight on the quality of the high school record.

Entrance Examinations

All candidates are required to write both the Scholastic Aptitude Test and the Achievement Tests of the College Entrance Examination Board. All candi-

dates are required to write the English Composition Achievement Test. Two other Achievement Tests which must be written will be determined by the particular college or program of studies in which the candidate is interested. The following may be referred to as a guide:

All Colleges	English Composition
Engineering Education (Teaching of High School Mathematics & Science) Liberal Arts (Mathematics & Science)	Advanced Mathematics and Physics or Chemistry
Education (Teaching of General Science) Liberal Arts (Premedical, Predental, Biology, Medical Technology) Pharmacy Nursing	Intermediate Mathematics and Biology or Chemistry
Liberal Arts (Psychology)	Intermediate Mathematics and choice of one other, preferably a science
Liberal Arts (non-science fields) Business Administration Education (non-science fields and Physical Education)	Choice of two other tests, with Biology suggested for Physical Education

Students who are studying in Advanced Placement Mathematics Courses in high school should write the Advanced Mathematics rather than the Intermediate Mathematics Achievement Test. Normally, candidates should take the Science Test in that subject which they studied as juniors, with May of the junior year or December or January of the senior year regarded as appropriate testing dates.

Applicants for admission should complete the Scholastic Aptitude Test in May of the junior year, in August before the senior year, or in December or January of the senior year. The Achievement Tests may be completed in March of the senior year or earlier if so advised by an admissions counselor or by the school guidance department. In certain cases the May testing date is appropriate.

For full information about College Board Examinations the student should consult his high school guidance office or write directly to:

> The College Entrance Examination Board
> P.O. Box 592
> Princeton, New Jersey

Students on the West Coast should write directly to:

> The College Entrance Examination Board
> Box 1025
> Berkeley, California 94701

Candidates' Reply Date

If the Committee on Admissions makes a favorable decision on an application, the student will be asked to submit a non-returnable tuition deposit of $50 by May 3, 1965. This deposit serves as an indication of intention to enroll and is applied to the student's first-term tuition account. Accepted candidates are urged to submit the tuition deposit as soon as possible.

Specific Course Requirements

Applicants for admission to the freshman class must qualify by graduation from an approved course of study in an accredited secondary school. The actual subjects which are prescribed for admission vary somewhat according to the college and program in which the applicant enrolls. These specific requirements are given in the section of this catalog describing the individual colleges and their programs.

Other Requirements

Formal requirements are necessary and desirable in that they tend to provide all entering students with a common ground upon which the first year of the college curriculum can be based. But academic credits alone are not an adequate indication of a student's ability to profit by a college education. Consequently, the Department of Admissions takes into consideration a student's interests and aptitudes, insofar as they can be determined, capacity for hard work, attitude toward classmates and teachers in high school, physical stamina and, most important of all, character. In this way the University seeks to select for its student body those who not only meet the academic admission requirements but who also give promise of acquitting themselves creditably in the rigorous program of training afforded by the Co-operative Plan of Education.

Personal Interview

Effective guidance depends in large measure upon a complete knowledge of a student's background and problems. Although a personal interview is not required, except for scholarship applicants and those who apply for admission to the College of Education, applicants are cordially welcome to come to the University to discuss their educational plans. The Admissions Office, 150 Richards Hall, is open on Monday through Friday from 9:00 a.m. to 4:00 p.m. and on Saturday morning from 9:00 a.m. to 11:30 a.m. Students are encouraged to arrange definite appointments for interviews.

Registration

Freshmen in the day programs will register at the University on Wednesday, September 8, 1965. Students are not considered to have met the requirements for admission until they have successfully passed the required physical examination. Registration must be in person.

Transfer or Advanced Standing

As a basic policy, students who wish to transfer to Northeastern in the same area of study, whether they seek credit or not, must have a satisfactory record in the institution where they previously studied. Transfer students are admitted only in September.

In general, students who wish to enter with advanced standing must meet these requirements:

1. Have courses which enable them to enter at the beginning of an academic year as regular students. Special students are not admitted to the Basic Colleges.

2. Have a grade equivalent of 2.5 (C+) or better.

3. Have the endorsement of an approved official in the college previously attended.

Persons who have a bachelor's degree, regardless of their fields of specialization, are not ordinarily accepted for admission as undergraduates except in the College of Pharmacy and the College of Nursing.

Full details of the University's transfer policy are available from the Department of Admissions upon request.

Outline of Freshman Courses

The first year is a period of full-time study during which the student must demonstrate fitness for the program which has been elected. For students enrolled in the Colleges of Liberal Arts, Education, Business Administration, Engineering, Pharmacy, and Nursing, the Co-operative Plan of training on the job begins with the second year. Students who are unsuccessful in the basic courses of the freshman year will not be permitted to continue with their advanced program, but will be advised to change their goal and type of training. In some instances this will mean change to another curriculum at Northeastern; in others, withdrawal from the institution. The freshman courses are so arranged as to permit change of objective during or at the end of the first year with a minimum loss of time.

College
Expenses

Tuition

Freshmen — The charge for tuition for all freshmen attending the Huntington Avenue campus is $320 per term. The charge for all freshmen attending the Burlington Campus is $285 per term. Tuition is payable as indicated in the schedule below. The difference in the tuition charge results from the unavailability of certain programs and services on the Burlington campus. These include, among others, student activities areas and physical recreational facilities.

Engineering Upper-Class Students — The charge for tuition for all Engineering upperclassmen is $420 per regular term and $210 per summer term.

Liberal Arts, Education, Business Administration, Pharmacy, and Nursing Upper-Class Students — The charge for tuition for all Liberal Arts, Education, Business Administration, Pharmacy, and Nursing Upperclassmen is $380 per regular term and $190 per summer term.

Student Teaching — The charge for student teaching in the College of Education is $190.

Schedule of Tuition Payments, 1964-1965

For Freshmen Attending Huntington Avenue Campus		For Freshmen Attending Burlington Campus	
Date of Payment	Tuition	Date of Payment	Tuition
September 9, 1964	$320	September 9, 1964	$285
November 23, 1964	320	November 23, 1964	285
February 1, 1965	320	February 1, 1965	285

The first term of the sophomore year, a five-week summer term, may be taken by freshmen either in April immediately following the freshman year, or in August. Payments are due on the first day of the term in which the work is taken. Payment for tuition in this five-week term is one half of upper-class tuition for the ten-week term.

For Upperclassmen (Co-operative Plan)

DIVISION A		Tuition Engineering	Tuition Liberal Arts, Pharmacy, Education, Nursing, and Business Admin.
September	14, 1964	$420	$380
February	1, 1965	420	380
*August	2, 1965	210	190

DIVISION B		Tuition Engineering	Tuition Liberal Arts, Pharmacy, Education, Nursing, and Business Admin.
November	23, 1964	$420	$380
April	12, 1965	420	380
*June	21, 1965	210	190

*Summer term (five weeks)

Full-Time Plan

Certain students in the College of Liberal Arts may elect non-co-operative full-time programs. Tuition rates are the same as for students on the Co-operative Plan, and payments are due on the corresponding dates.

Tuition Deposit

Applicants accepted for admission must upon request pay a non-returnable tuition deposit of one hundred dollars ($100) as evidence of their intention to enroll, and this will be applied on their first tuition payment.

Payment of Tuition

All payments should be made at the Bursar's Office which is located on the second floor of Richards Hall. Checks should be made payable to Northeastern University. Students are not eligible to attend classes beginning with the second week of any term unless their tuition has been paid or specific arrangements have been made with the Bursar for a plan of deferred payment. Deferred payment of tuition entails a fee of two dollars ($2).

Late-Payment Fee

A fee of five dollars ($5) will be assessed for failure to make or arrange for payments in accordance with the prescribed regulations.

Accident and Sickness Insurance

An excellent low-cost accident and illness insurance covering "in-hospital" care is available to all Northeastern University students through a group insurance plan. The cost of this insurance is eighteen dollars ($18) for the calendar year, payable in advance. Students living away from home are required to

participate in the plan; commuters may do so if they wish. Circulars giving details of the insurance coverage will be sent to all candidates at the time their applications for admission to the University are accepted.

Laboratory Deposits

Freshmen taking chemistry make a Chemical Laboratory deposit of fifteen dollars ($15) at the beginning of the year from which deductions are made for breakage, chemicals, and destruction of apparatus in the laboratory.

Upperclassmen taking chemistry laboratory work make deposits at the beginning of each such term as follows:

Sophomores and Middlers $15
Juniors 15
Seniors 20

Upperclassmen in Pharmacy take laboratory work and must make deposits at the beginning of each term as follows:

Middlers, Juniors, and Seniors $15

Reserve Officers' Training Corps — Uniform Deposit

Freshmen enrolling in ROTC make a deposit of ten dollars ($10) to cover loss of or damage to ROTC uniform and equipment. Any loss or damage exceeding the deposit will be charged to the student.

Application Fee

A fee of ten dollars ($10) is required when the application for admission is filed. This fee is non-returnable.

Late Registration Fee

A fee of five dollars ($5) will be charged for failure to register in accordance with prescribed regulations on the dates specified in the college registration bulletins. Registration must be made in person.

Graduation Fee

A fee of twenty dollars ($20) covering graduation is required by the University of all candidates for a degree. This fee must be paid before the end of the fifth week of the last scholastic term in the senior year.

Estimated College Expenses for a Freshman (Boston Campus)

The following data, compiled from expense returns submitted by the student body, give an idea of freshman expenditures under ordinary conditions:

Application Fee	$ 10
*Tuition and Fees	960
Chemical Laboratory Deposit (for those taking chemistry)	15
Books and Supplies	75
Accident and Sickness Insurance (optional for commuters)	18
ROTC Deposit (for those electing ROTC only)	10
	$1088

(Engineering students should add approximately $50 for drawing instruments and equipment.)

*This covers the first three ten-week terms. Pharmacy students have a five-week fourth term included as part of their freshman-year program. Tuition for this term is $190.

Living Expenses Per Ten-Week Term for a Freshman Residing in a University Dormitory

Room Rent and Board	$300

Students should allow an additional amount for clothing, incidentals and personal expenses. This amount will vary with individual tastes and spending habits.

Refunds

The University provides all instruction and accommodations on an academic term basis; therefore, **no refunds are granted except in cases where students are compelled to withdraw on account of personal illness or for other reasons beyond their control.** A student must complete an official withdrawal application before a refund can be considered. Questions regarding refunds should be discussed with the Dean of Students.

Financial Aid

SCHOLARSHIPS FOR FRESHMEN

Students interested in applying for freshman scholarships and loans may obtain detailed information from:

Kenneth W. Ballou
Chairman, Freshman Scholarship Committee
Associate Director of Admissions

Alumni Scholarships   All Colleges

Four full-tuition scholarships for an entering freshman in each of the Basic Colleges are awarded annually by the Northeastern University Alumni Association through the generosity of donors' gifts to the Alumni Fund.

Applications are open to graduating high school seniors showing evidence of scholastic achievement and financial need.

An equal amount of scholarship assistance is granted by the Alumni Association to students enrolled in University College.

Henry B. Alvord Memorial Scholarships
in Civil Engineering   Engineering

Established in 1940 in memory of the late Henry B. Alvord, Professor of Civil Engineering and Chairman of the Department for eighteen years, the award is made annually to a student graduating from an accredited secondary school who demonstrates superior academic ability and gives promise of succeeding in civil engineering. The grant of $250 is made only to an entering freshman who is qualified for and plans to study civil engineering.

Armstrong Rubber Company Scholarships   All Colleges

Established in 1960, the Armstrong Rubber Company of West Haven, Connecticut, offers annually a scholarship in the amount of $1,800 to a qualified boy or girl admitted to the University for a full-time program of study. Although

children of Armstrong Company employees are given preference, any student residing in New Haven County is eligible to apply.

Recipients of the scholarship will participate in the University's Co-operative Program and will be expected to spend at least four periods of student employment with the firm. Scholarship applications are available from the Company upon request and should be returned to the Personnel Office no later than April 30 of the year in which the student plans to enter the University.

Board of Educational Assistance Scholarships   All Colleges

This program was established in 1957 by the Commonwealth of Massachusetts to provide scholarship aid to Massachusetts students pursuing full-time day schedules in accredited collegiate institutions. Awards are made in the fall of each year, and applications for freshmen are available through their high school guidance counselors.

Gardner A. Caverly Scholarship Fund   All Colleges

This fund was established in 1957. Qualified students are selected in the following order of preference:

1. A son or daughter of an employee of the Rutland, Vermont, Railroad Corporation.
2. A graduate of the Rutland, Vermont, High School.
3. A graduate of the Laconia, New Hampshire, High School.
4. A boy or girl from any such secondary school as Mr. Caverly might care to designate during his lifetime.

Should there be no candidate available with the above qualifications, the scholarship shall be awarded to any worthy student from the New England area.

Community Scholarships   All Colleges

The Community Scholarships were established by President Asa S. Knowles in 1963. Northeastern will grant scholarships in the amount of $500 to qualified students from the following communities: Ashland, three scholarships; Boston, twelve scholarships; Burlington, three scholarships; and Weston, three scholarships.

The Cotrell Company Engineering Scholarship   Engineering

In 1961, The Cotrell Company of Westerly, Rhode Island, established an annual scholarship of $1,000 to be awarded to a senior in the upper fourth of his class attending a high school in the Westerly area or to a senior in any high school who is the son of an employee of The Cotrell Company. Selection preference will be given to sons of employees and to students who have a long-range interest in the specialized fields of mechanical, electrical and industrial engineering.

Carl Stephens Ell Alumni Scholarships   All Colleges

To honor Dr. Carl Stephens Ell, the second president of Northeastern University, the Alumni Association, in 1958, established these scholarships. Either freshmen or upperclassmen enrolled at the University are eligible. Awards will be made to worthy students on the basis of scholastic ability and need. The

scholarships are to be distributed as equitably as possible among students in the Basic Colleges and University College. Preference shall be given to sons and daughters of Northeastern Alumni.

Elmer H. and Daisy M. Everett Scholarship   All Colleges

The purpose of this fund, established in 1961, by Mr. and Mrs. Elmer H. Everett, is to provide scholarship aid for a qualified entering freshman or upperclass student who will receive the greatest benefit from this assistance. The scholarship, to be awarded annually, will be equal to one-half tuition for a full academic year.

Preference will be given to a worthy student who is a member of, or the son or daughter of a member of, the Carter Memorial Methodist Church of Needham Heights, Massachusetts, or to another student suggested by the minister of this church. Should there be no qualified candidate available from the above source, then the scholarship shall be awarded to any worthy boy or girl.

General Motors Scholarships   All Colleges

General Motors has a vital interest in higher education in America. Under its "College Plan," one five-year scholarship is granted to a high school senior of high ability who has been admitted to one of Northeastern's Basic Colleges.

College of Nursing Scholarships   Nursing

Scholarships are made available to students in the College of Nursing through a fund established by contributions from Northeastern University, Permanent Charities Fund, Massachusetts General Hospital, Children's Hospital Medical Center, and the Beth Israel Hospital. The application procedures and qualifications for selection are the same as those for all other scholarships.

Charles Hayden Memorial Scholarships   All Colleges

The Charles Hayden Foundation, created by the will of the late Charles Hayden, an alumnus of the Boston English High School, offers annually memorial scholarships to freshmen at Northeastern University. The scholarships are awarded to "deserving boys" whose parents are unable to finance the entire cost of their education.

Massachusetts Scholarship Foundation   All Colleges

The Massachusetts Scholarship Foundation is a private, nonprofit organization, established in 1957 by a charter from the General Court acting on the request of Governor Furcolo. The Foundation exists to help Massachusetts students finance higher education.

Awards are made to residents of Massachusetts who are entering the freshman year at Massachusetts colleges and junior colleges, and are reserved for those students with severe financial need who will not receive from other sources sufficient help to enable them to meet their college expenses.

Awards are made for one year only and range in amount from $200 to $800, depending on college costs and the student's financial circumstances.

Applications must be initiated by the secondary school from which the student is graduated or the college to which the student is admitted as a freshman. A student seeking assistance should consult his high school guidance counselor or the scholarship officer at the college of his choice.

Regional Scholarships   All Colleges

Secondary school students who do not reside within normal commuting distance of Northeastern University, who have demonstrated superior achievement in their studies, and who are strongly endorsed by their principals and guidance officers, may qualify for a Regional Scholarship. Scholarships range in amount from $1,000 to $1,800. Recipients are required to live in University-sponsored residence halls.

Scholarships for Women   All Colleges

In addition to the Trustee awards, certain special scholarships are available each year for young women entering the freshman class. These scholarships are awarded to well-qualified women who expect to enter the College of Liberal Arts, Education, Business Administration, Pharmacy, Engineering, or Nursing. High scholastic standing, evidence of leadership ability, and financial need are important considerations.

The Northeastern Faculty Wives Scholarship. Each year the Faculty Wives of Northeastern University offers a half-tuition scholarship to a young woman of limited financial resources who has demonstrated a likelihood of succeeding in her chosen professional field.

Trustee Scholarships   All Colleges

Established in 1928 by the Board of Trustees of Northeastern University, these full- and partial-tuition scholarships are granted in the six Basic Colleges each year to entering freshmen who have demonstrated superior scholastic attainment throughout their preparatory or high school courses.

AWARDS FOR FRESHMEN

Power Systems Engineering Grants-in-Aid   Electrical Engineering

A number of public utilities and power equipment manufacturing companies in the northeastern part of the United States have made available grants-in-aid ranging from $1,000 to $1,800 to assist able freshmen who are planning to undertake the six-year, integrated, co-operative program in power systems engineering leading to the degrees of Bachelor of Science and Master of Science in Electrical Engineering. These awards are made on the basis of academic achievement in high school and aptitude for and interest in the field of power systems engineering, without regard to financial need.

Candidates for such grants-in-aid should apply to the Dean of Admissions at Northeastern University not later than March 1 of the year in which they wish to enter the College of Engineering.

LOANS FOR FRESHMEN

National Defense Student Loan Program   All Colleges

Any student in good standing who can demonstrate financial need is eligible to apply to the Director of Financial Aid for Students at Northeastern for assistance under the National Defense Student Loan Program. Recipients of the loans are selected by the University. The law requires that each borrower be a full-time student, in need of the amount of the loan, and capable of maintaining a good standing in his chosen course of study.

A student may borrow up to $1,000 in one year, and a maximum of $5,000 during his entire college career. Special consideration is given to superior students in the Colleges of Education and Engineering, and to science, mathematics, and foreign language majors in the College of Liberal Arts.

Loans to students who plan to teach in elementary and secondary schools after graduation will be canceled up to a maximum of 50 per cent at the rate of 10 per cent for each year of such teaching. No interest is charged on loans until one year after graduation. Thereafter interest is paid at the rate of 3 per cent per year. Borrowers may have up to 10 years to repay.

The New England Society Student Loaning Fund   All Colleges

The purpose of this revolving Student Loaning Fund, established by the New England Society, is to make available to deserving students, especially those of New England birth or ancestry, small amounts of money as temporary loans to meet emergencies.

It is not intended to be used for large loans to cover scholarships, board, or room rent, or for loans which will be outstanding more than one year.

SCHOLARSHIPS FOR UPPERCLASSMEN

Upperclassmen showing evidence of financial need may apply for scholarship assistance in the Office of the Director of Financial Aid for Students.

Dr. Martin E. Adamo Scholarship   Pharmacy

This scholarship of $100 is given annually by the Boston Association of Retail Druggists in memory of Dr. Martin E. Adamo, the second president of the New England College of Pharmacy.

American Foundation for Pharmaceutical Education
Scholarships   Pharmacy

The Board of Grants of the American Foundation for Pharmaceutical Education provides two scholarships of $200 each to be awarded to junior or senior students on the basis of scholarship and financial need with the understanding that the University will match the awards to the students selected. The use of the funds is restricted to the payment of tuition and laboratory fees.

The Boston Section of The American Society for Quality Control Scholarship
All Colleges

This award of $100 annually was established in 1961 by the Boston Section of The American Society for Quality Control to provide financial aid for worthy students in a degree program in any of the colleges in the University.

The Henry Francis Barrows Scholarships
All Colleges

Established in 1949, the four Henry Francis Barrows Scholarships of $250 each, provided under the will of Fanny B. Reed, are offered to Protestant young men, born and brought up in New England. Good scholastic standing, good character, and need must be demonstrated by recipients of the scholarships.

The Mr. and Mrs. Emil Matthew Bauer Fund
All Colleges

The interest from the Fund, established in 1954, is used for scholarships or other financial assistance to students of German birth or of German extraction studying at Northeastern University. The scholarships are available to either men or women students enrolled in any year at the University.

Board of Educational Assistance Scholarships
All Colleges

This program was established in 1957 by the Commonwealth of Massachusetts to provide scholarship aid to Massachusetts students pursuing full-time day schedules in accredited colleges. Awards are made in the fall of each year, and applications for upper-class students are available during May in the Office of the Director of Financial Aid for Students.

The Boston Rubber Group Scholarship
Chemistry, Chemical Engineering

This scholarship, established in 1962, is to be awarded in whole or in part to one or more chemistry or chemical engineering co-operative students on the basis of merit, need, scholarship, and personal qualifications. The Boston Rubber Group is sponsored by the Division of Rubber Chemistry, American Chemical Society.

Boston Society of Civil Engineers Scholarship in Memory of Desmond FitzGerald
Civil Engineering

In 1931 the Boston Society of Civil Engineers established a scholarship in memory of Desmond FitzGerald, a former president of the Society and an eminent hydraulic engineer with a distinguished record of service.

It has been awarded annually since 1931 to an outstanding Northeastern University senior or junior student in the Department of Civil Engineering of the College of Engineering. The presentation is made by the President of the Boston Society of Civil Engineers at the Society's annual meeting in the spring of the year.

Martin Brown Scholarship Fund
Electrical Engineering

This scholarship was established in 1961 by Mr. Martin Brown, an engineering alumnus of the Class of 1921. The purpose of this scholarship is to assist

qualified students enrolled in electrical engineering who have need and who have demonstrated above-average scholastic ability.

Wellington Burnham Fund   All Colleges

This fund provides financial assistance to worthy students of limited means without discrimination as to race, creed, color, or scholastic attainment. It was established in 1961 under the provisions of the will of George A. Burnham.

Chemistry,
Chemical Club of New England   Chemical Engineering

To promote interest in the chemistry or chemical engineering field in New England, the Chemical Club of New England has made generous scholarships available to junior and senior students who are majoring in chemistry or chemical engineering and who show promise of success in either field.

Recipients of these scholarships must be residents of New England and must have financial need, above-average grades, and a good co-operative work record.

Connecticut Alumni Club Scholarship   All Colleges

Each year the Connecticut Alumni Club awards a scholarship to a student from the State of Connecticut who has achieved a high academic average in his freshman year and has demonstrated financial need. The scholarship is to be used toward the tuition expense of the sophomore year. This scholarship was established in 1958 to promote Northeastern University among the preparatory schools of Connecticut.

Electrical Manufacturers Representatives Club of New England, Inc., Scholarship   Electrical Engineering

Established in 1958, this scholarship of $475 is granted to a student or students majoring in electrical engineering, without regard to race, creed, or color. To qualify students must have real financial need and excellent scholastic standing.

Carl Stephens Ell Alumni Scholarships
Elmer H. and Daisy M. Everett Scholarship

(For a description of these two scholarships, see pages 34, 35.)

Clara and Joseph F. Ford Scholarship   All Colleges

In 1947 friends and employees of Clara and Joseph F. Ford united to provide tuition scholarships for worthy, needy, and well-qualified students who have demonstrated a democratic and tolerant spirit and who are well disposed toward people of all creeds and races.

Gilman Brothers, Inc., Drug Wholesalers   Pharmacy

This scholarship of $250 is given annually by Gilman Brothers, Inc., to help a student further his education in pharmacy.

Greater Lynn Druggists' Association   Pharmacy

This scholarship of $100 was established in 1960 by the Greater Lynn Druggists' Association. The scholarship is awarded to a student who has satisfactorily completed at least one year of the pharmaceutical curriculum, is a resident of the Greater Lynn Area (Lynn, Nahant, Saugus, and Swampscott), has satisfactory grades, and is in need of financial assistance. Application for the scholarship should be made before June 1, in the form of a letter addressed to the secretary of the Greater Lynn Druggists' Association.

Rabbi Myer O. Grunberg Scholarship   All Colleges

Established in 1953 by Mrs. Myer O. and Miss Rose Grunberg, this annual award is available to a senior student in any college of the University. The award is made to that man or woman student who has evidenced in personal, business, and student relations those characteristics of leadership and human relations which make for a better social order. There is no restriction as to race, creed, color, or sex.

Avrom Aaron Leve Memorial Scholarship   Psychology

This scholarship fund was established in 1957 in memory of Dr. Avrom Aaron Leve, former Assistant Professor of Psychology. The interest is used annually to provide scholarships for upper-class students majoring in psychology. The award is made on the basis of academic achievement, financial need, and character.

Richard H. Lufkin Fund   Engineering

This fund was established at Northeastern in 1960 under the will of the late Elizabeth A. Lufkin in memory of her brother. Numerous annual scholarships are made available to students majoring in electrical or mechanical engineering. In order to qualify an applicant must demonstrate a good academic record and show real financial need. The scholarships vary from $100 to full tuition for any one term.

Massachusetts State Pharmaceutical Association   Pharmacy

This scholarship of $200 established by the Massachusetts State Pharmaceutical Association, is awarded annually to a student who must be a resident of Massachusetts.

The Massachusetts State Pharmaceutical Association also awards a number of scholarships of $100. Application for these scholarships may be secured from the office of the Association at 11 Beacon Street, Boston.

McKesson & Robbins, Inc., Drug Wholesalers   Pharmacy

This scholarship of $200, given annually by McKesson & Robbins, Inc., is awarded to a worthy student in financial need.

Frederick W. Muckenhoupt Scholarship   All Colleges

This award was established in 1961 by Dr. and Mrs. Carl F. Muckenhoupt in memory of their son, Frederick W. Muckenhoupt, Class of 1959 of the College of Engineering.

The award is to be made annually to a student in good standing on the basis of need. Preference is given to a student enrolled in the Department of Electrical Engineering.

The New England Paper Merchants, Inc., Scholarship   All Colleges

Established in 1959 by the New England Paper Merchants Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated by his co-operative work achievement and his extracurricular activities an interest and potential in the field of sales. The recipient shall also be a student who has financial need, a good academic record, and high character.

Norfolk County Pharmaceutical Association Scholarship   Pharmacy

This scholarship of $50 is awarded annually to a student who meets the requirements both financially and scholastically and is a resident of one of the member towns covered by the Norfolk County Pharmaceutical Association (Norwood, Dedham, Canton, Walpole, Millis, Needham, Westwood, and Islington).

The Rho Pi Phi Boston Alumni Chapter Scholarship   Pharmacy

The Boston Alumni Chapter of the Rho Pi Phi International Pharmaceutical Fraternity established in 1958 for Tau Chapter a $100 scholarship. It will be awarded to a needy student in his fourth year who, through his entire course, has been proficient in his studies and has been instrumental in promoting good will and the principles of Rho Pi Phi.

The Rho Pi Phi Ladies Auxiliary Scholarship   Pharmacy

The Rho Pi Phi Ladies Auxiliary, Boston Alumni Club, established a pharmacy scholarship in 1960. One hundred dollars is to be awarded annually to a member of Tau Chapter in the junior class who has attained scholastic proficiency and has been instrumental in promoting good will among his fellow students, and who, by his behavior, has been a credit to Rho Pi Phi Fraternity. The recipient is to be selected by two officers of Tau Chapter and the Dean of the College of Pharmacy.

The Rho Pi Phi Supreme Council Trust Fund Scholarship Pharmacy

The Rho Pi Phi Supreme Council Trust Fund Scholarship of $100 is to be awarded to that member of Tau Chapter who has completed his junior year (fourth year) in the College of Pharmacy, has attained scholastic proficiency, has financial need, has been instrumental in promoting good will among his fellow students, and who, by his behavior, has been a credit to Rho Pi Phi.

J. R. Rosen Scholarship   All Colleges

Established in 1958, this scholarship of $400 is granted to a student or students in the College of Engineering, Business Administration, Liberal Arts, Pharmacy, or Education, with due regard for need and capacity to profit by attendance at college, but without restrictions as to race, creed, or geographic origin.

Frank B. Sanborn Scholarship Fund   Engineering

The Frank B. Sanborn Scholarship Fund was established in 1958 to provide a scholarship or scholarships of not more than $500 to worthy and needy

students selected by the University, without restrictions as to race, creed, or geographic origin, but with preference being given to students majoring in electrical, mechanical, civil, or industrial engineering, in the order stated.

Each recipient must be willing to assume a moral obligation to reimburse the fund as he may be able, in order to make similar financial aid available for other students in later years. There shall be no interest charged and no time specified for reimbursement.

William Lincoln Smith Scholarship Fund   Electrical Engineering

The fund was established in 1947 by Farnham Wheeler Smith, Class of 1924, Benjamin Lincoln Smith, Class of 1923, Thomas Hollis, Jr., Class of 1941, and other members of the family in honor of Dr. William Lincoln Smith, who served long, faithfully, and with distinction as Chairman of the Department of Electrical Engineering at Northeastern University.

The income from the fund is used for an annual scholarship award to a student enrolled in the Department of Electrical Engineering who has demonstrated excellence in some aspect of electrical research, stands high in his courses, or otherwise exhibits promise of future competence in the field. The award shall preferably be granted to a student who needs financial assistance to continue his college work.

Southeastern Massachusetts Druggists' Association
Scholarships   Pharmacy

These scholarships of $100 are awarded annually to pharmacy students from the Southeastern Massachusetts area (Fall River, New Bedford, Dartmouth, Somerset, Onset, Wareham, Orleans, Swansea, Attleboro, Hyannis, South Yarmouth, Taunton, Vineyard Haven, Middleboro, Fairhaven and Acushnet). Applicants for scholarships must complete applications yearly.

South Middlesex Pharmaceutical Association   Pharmacy

This tuition scholarship of $100, established in 1960, is awarded annually to a pharmacy student enrolled in the third, fourth, or fifth year who is in good scholastic standing and in financial need, and living in the area covered by the South Middlesex Pharmaceutical Association (Arlington, Belmont, Lexington, and Watertown). The recipient will be selected by the Scholarship Committee.

South Shore Pharmaceutical Association Scholarship   Pharmacy

The Scholarship Committee of the Association will select a freshman student in June of each year living in the area covered by the South Shore Pharmaceutical Association (Quincy, Braintree, Weymouth, Hull, Randolph, Hingham, Holbrook, and Cohasset) who will be awarded a $100 scholarship to be applied to the tuition of the first semester of the sophomore year.

Springfield Druggists' Association Scholarship   Pharmacy

A scholarship of $100 is offered by the Springfield Druggists' Association. This is to be awarded to a sophomore or junior maintaining the highest average in the Department of Pharmacy, and who is worthy and in need of financial assistance. The Springfield Druggists' Association Scholarship Fund was established in 1956.

Charles Irwin Travelli Scholarships All Colleges

Numerous scholarships have been given yearly since 1950 to students demonstrating financial need, high academic achievement, and an active interest in University life as shown by participation in one or more major activities. Students are named as recipients of Travelli Scholarships at the completion of their sophomore year. Under normal circumstances these awards will continue through the senior year.

Samuel Ulman Scholarship Fund All Colleges

This fund was established in 1960 by Mrs. Samuel Ulman in memory of Samuel Ulman, a student at Northeastern University from 1912 to 1915. The purpose of the fund is to provide scholarship assistance to students who have financial need and good scholastic standing.

United Consumers, Inc., Scholarship Pharmacy

In 1958, United Consumers, Inc., established this $250 scholarship. It is awarded annually to the senior student, who, during his first four years, has shown superior scholarship, excellent school spirit, and exhibits general promise and interest in the field of pharmacy.

United States Rubber Company Foundation Scholarships
Engineeering, LA, BA

The United States Rubber Company Foundation has established scholarships to be awarded to students in the Colleges of Engineering, Business Administration, and Liberal Arts who qualify on the basis of leadership and character, academic performance and potential, need for financial assistance, and demonstration of interest in a career in industry.

Recipients assume a moral obligation to repay at least 25 per cent of any scholarship received to the University Scholarship Fund after graduation. Students must have completed at least two years of their undergraduate program to be eligible.

University Scholarships All Colleges

Northeastern University has for many years maintained a scholarship fund for deserving, qualified students. These scholarships are awarded on the basis of need, scholastic standing, and campus citizenship. The recipient of a Northeastern scholarship must be willing to assume a moral obligation to repay the University at some future date.

Henry E. Warren Scholarships All Colleges

Established in 1958 by the Warren Benevolent Fund, Inc. The purpose of these scholarships is to encourage students to gain co-operative work experience reinforcing study in their major field.

Scholarship awards in the total amount of $1,000 are awarded annually without restrictions as to race, creed, or national origin, to upper-class students in fields in which related co-operative work positions are few or poorly paid. The recipients of the scholarship must have demonstrated good scholastic standing, fine character, and financial need.

Western Electric Fund Scholarship Award   Engineering

This scholarship, established in 1956, is awarded annually to an upper-class student in mechanical, electrical, or industrial engineering. The recipient must be an outstanding student who also has financial need. The Western Electric Company is the manufacturing company for the Bell Telephone System.

Women's Auxiliary of the Waterbury Druggists Association Pharmacy

A scholarship award in the amount of $300 will be given by the Women's Auxiliary of the Waterbury Druggists Association to a young man or woman of the Waterbury area upon the successful completion of his or her second year in an accredited school of pharmacy. The grant is based on financial need, academic standing, and the recommendation of the Dean.

AWARDS FOR UPPERCLASSMEN

University awards are determined by scholastic and citizenship achievement. They are presented by appropriate committees headed by the Dean of Students and do not require a demonstration of financial need.

The Academy Award   Liberal Arts

The Academy, the honor society of the College of Liberal Arts, offers annually an award of $100 to the sophomore in the College of Liberal Arts who, during the previous year as a freshman, made the highest scholastic record.

William J. Alcott Memorial Award   All Colleges

This award was established in 1934 by members of the faculty and other friends to perpetuate the memory of William Jefferson Alcott, Jr., a brilliant member of the Northeastern Department of Mathematics from 1924 until his death in 1933. The award, made annually from the income of the fund, is for outstanding scholastic achievement during the preceding year, either in a particular field of interest or for a superior academic record.

Alumni Awards for Professional Promise   All Colleges

Established in 1947 by the Alumni Association, these awards are presented annually at a final senior class meeting in the spring of the year. The awards are made to the outstanding seniors in each of the five Basic Colleges who have demonstrated unusual professional promise through their character traits, scholastic achievement, and co-operative work performance.

The Beta Gamma Sigma Society Award   Business Administration

The Massachusetts Delta Chapter of Beta Gamma Sigma, the national honorary society of colleges of business administration, offers an annual scholarship of $100 to the sophomore in the College of Business Administration who, during the previous year as a freshman, made the highest scholastic record.

Sears B. Condit Honor Awards   All Colleges

These awards were established in 1940 through the generosity of Sears B. Condit. In the fall of the year at a University convocation, Sears B. Condit Honor Awards, not less than 20 in number, are awarded annually to out-

standing students in the senior class of the Colleges of Liberal Arts, Business Administration, Pharmacy, Education, Engineering, and Nursing. Each award carries a stipend of not less than $100 as well as a certificate of achievement.

The Harold D. Hodgkinson Achievement Award   All Colleges

Established in 1954, the Harold D. Hodgkinson Achievement Award of $500 is granted annually to a junior student for his senior year. The winner of the award is known as the Hodgkinson Scholar for the year in which he is chosen.

The award is based primarily upon distinguished scholastic achievement with due consideration of character, personality, qualities of leadership, co-operative work experience, military record, if any, and service in voluntary organizations and activities. Student leadership accomplishments and professional potential are evaluated in connection with these criteria.

Other qualifications being equal, a relative of the donor or a candidate connected with Filene's by co-operative work or relationship is given preference. The Hodgkinson Scholar is chosen by a committee of administrative members of the faculty. An appropriate certificate is presented to the recipient as a permanent record of his selection.

Kappa Iota Epsilon Award   Education

Kappa Iota Epsilon, the College of Education honor society, offers an annual award of $100 to the education sophomore who, during the freshman year, achieved the highest scholastic record.

Julia and Merrill Robert Lovinger Award   All Colleges

This annual $100 award was established in 1960 by William Lovinger for the purpose of giving assistance to a student who has financial need and acceptable scholastic standing.

Robert Lubets Award   Business Administration

The award was established in 1953 by the Boston accounting firm of Robert Lubets & Company to recognize outstanding professional development and personal growth by students training for careers in accounting. One hundred dollars will be awarded to that degree candidate who at the completion of his junior year has demonstrated the greatest personal growth and professional development as evidenced by his improvement in scholastic achievement accompanied by professional aptitude, indicative of future success as an accountant.

Harold A. Mock Award   Business Administration

Established in 1959 by Harold A. Mock, a distinguished alumnus of the University, this annual award of $200 is made to an outstanding member of the junior class in the College of Business Administration. The Committee on Scholarships selects the recipient on the basis of high academic standing and co-operative work achievement, participation in University extracurricular activities, personality, and character.

Ruth E. Phalen Memorial Award Fund   All Colleges

This fund was established in 1959 by Thomas E. Phalen, Jr., a member of the faculty, in memory of his wife. The income from this fund is used yearly

as a cash award to a senior, junior, or middler, preferably in the College of Engineering, who maintains at least a 2.0 academic average, shows outstanding ability in one or more varsity sports, and demonstrates excellent campus citizenship.

Roland Guyer Porter Memorial Fund   Electrical Engineering

This fund was established in 1953 by colleagues and friends of the late Professor Roland G. Porter, for many years head of the Department of Electrical Engineering. Interest from the fund provides an annual award to a student in the Department of Electrical Engineering who best exemplifies the qualities of mind and character which Professor Porter did so much to develop in his lifetime.

President's Awards   All Colleges

Since 1929, at the annual Dean's List Dinner in both divisions, four scholarships of $100 each, known as the President's Awards, have been presented to the students with the outstanding records in the sophomore, middler, junior, and senior classes. The awards are accompanied by a congratulatory letter from the President.

ROTC Awards   ROTC

Awards totaling $1,000 are available to ROTC cadets each year. The University offers nine $50 awards annually. They are: one to the outstanding freshman cadet, four to sophomores (one in each branch and division), two to middlers (one to each branch), and two to juniors (one in each branch).

Scabbard and Blade (the cadet officers' honorary society) offers four $125 awards annually to middlers. The Pershing Rifles (the basic course honorary society) offers a $50 award to a sophomore Pershing Rifles cadet.

Academic Achievement Awards are won by each cadet in the top 10 per cent of ROTC classes. This award, an embroidered wreath, is worn on the right sleeve of the uniform during the year immediately following. Leadership Achievement Awards, consisting of letters of commendation, are awarded to each cadet in the top 10 per cent in leadership potential.

Many medals and trophies are also awarded by other organizations to ROTC cadets for achievements in diverse fields.

Tau Beta Pi Award   Engineering

Massachusetts Epsilon Chapter of Tau Beta Pi Association, national honorary society in engineering, offers annually a scholarship of $100 to the sophomore in the College of Engineering who, during the previous year as a freshman, made the highest scholastic record.

Woman of the Year Award   All Colleges

The women's societies of the University sponsor on annual scholarship of $100 to the senior woman student who, by high scholastic attainment and by demonstration of the quality of leadership, has proven herself the outstanding woman student of the year.

LOANS FOR UPPERCLASSMEN

John W. Dargavel Foundation   Pharmacy

This organization was set up to help finance students in pharmacy. Loans are made without interest to students in good standing during the last three years of their pharmaceutical education. As of June 1, 1961, loans to pharmacy students cannot exceed $350 on any one loan and no loans in excess of $700 will be made in any one year to any student in pharmacy. Repayments are made in monthly installments starting 30 days after graduation from pharmacy college. To be eligible, a student must have had at least one year's experience in a pharmacy.

For further information write to John W. Dargavel Foundation, 4101 East Michigan Street, Indianapolis 1, Indiana.

Higher Education Loan Plan (HELP)   All Colleges

The Massachusetts Higher Education Assistance Corporation was chartered in 1956 by the Massachusetts legislature to aid young men and women of the state to complete their programs of higher education. Students who are residents of Massachusetts and who have satisfactorily completed the freshman year, are eligible for HELP loans. Loans are generally limited to $500 in any one academic year, with an over-all limitation of $1,500.

Full information and the required application forms may be obtained from any of the national banks and trust companies in Massachusetts participating in the program.

National Defense Student Loan Program
The New England Society Student Loaning Fund

(For a description of these two loans funds, see page 37.)

University Long-Term Loan Fund   All Colleges

Northeastern maintains a loan fund for the purpose of aiding students in meeting their tuition expenses from term to term.

This fund is in many ways similar to the National Defense Loan Fund. Money borrowed need not be repaid until after graduation; and interest, at the rate of 3 per cent, does not become effective until one year after that time.

Students who qualify for this assistance may borrow as much as full tuition for any given term.

Student
Activities

Northeastern University regards student activities as an integral part of its educational program. The Student Activities Office is charged with the responsibility of co-ordinating the various types of activities and of administering the social, musical, literary, and athletic organizations in such a way as to enable each to contribute in a wholesome, worthwhile manner to student life at Northeastern. Every student is encouraged to participate in such activities as may appeal to him.

Members of the faculty also are interested in extracurricular activities. A faculty adviser is appointed for each student organization. His function is to encourage the students in the development of their programs, and to give them the benefit of his experience and mature point of view in integrating these programs with other important phases of college life.

One of the outstanding contributions of the Co-operative Plan in the field of higher education has been its capacity to develop in students those powers of social understanding that are so essential to success in professional life. At Northeastern the program of student activities is made to contribute to this end in a very real way. It is a conscious aim of the student activities advisers to develop among their advisees those qualities of personality and character which will enhance their usefulness as future business or professional men and as citizens.

Students have splendid opportunities to develop administrative and executive ability as leaders of undergraduate organizations. No academic credit is awarded for any student activity. This has been no deterrent, however, to student participation in extracurricular activities, for a substantial majority of the undergraduate body participates annually in one or more forms of student activity.

Athletics

The University maintains both varsity and freshman teams in baseball, basketball, cross-country, football, hockey, and track. Games and meets are arranged with many eastern colleges. A well-rounded program of intramural sports is available for men students, and a program of intramural sports and dance is offered to women students. The girls also play basketball with girls from other colleges in the Boston area.

Athletic policies for the University are determined by the Committee on Student Activities. This committee determines the eligibility of students to participate in athletics, approves the various sports schedules, and approves awards of letters and numerals to qualified athletes.

Honor Societies

Twelve honorary societies are chartered in the Colleges:

Phi Kappa Phi, national interdisciplinary honor society.

Tau Beta Pi, in the College of Engineering (Massachusetts Epsilon Chapter).

Eta Kappa Nu, in the Department of Electrical Engineering (Gamma Beta Chapter).

Pi Tau Sigma, in the Department of Mechanical Engineering (Northeastern Tau Kappa Chapter).

Phi Alpha Theta, in the College of Liberal Arts, History Department (Northeastern Zeta Tau Chapter).

Pi Sigma Alpha, in the College of Liberal Arts, Political Science Department (Northeastern Delta Gamma Chapter).

Alphi Pi Mu, in the College of Engineering, Industrial Engineering.

The Civil Engineering Honor Society.

Kappa Iota Epsilon, in the College of Education.

Beta Gamma Sigma, in the College of Business Administration (Massachusetts Delta Chapter).

The Academy, in the College of Liberal Arts.

Rho Chi Society (Beta Tau Chapter), in the College of Pharmacy.

Election to the college honorary societies is based primarily upon scholarship, but, before a man or woman is privileged to wear the honorary society insignia, there must be evidence of an integrity of character and an interest in the extracurricular life of the University as well as a pleasing personality. The societies have memberships consisting of the outstanding men and women in the Colleges. Election to an honorary society is the highest honor that can be conferred upon an undergraduate.

Publications

The News — A college newspaper, the **Northeastern News,** is published each week throughout the college year by a staff selected from the student body. The copy is prepared, edited, and published by the students themselves with the counsel of a faculty adviser. Opportunity is afforded for the students to express their opinions on subjects relating to study, co-operative work, social events, and topics of the day. Positions on the **News** staff and promotions are attained by competitive work. The paper is in part supported by advertising, both national and local, and in part by a portion of the student activities fees. The **Northeastern News** is a member of the Eastern Intercollegiate Newspaper As-

sociation and sends one of its editors to the annual convention of this association each year. Copies of the **News** are mailed to upperclassmen when they are on co-operative work and to freshmen after the close of their college year.

The NU Writer — A literary magazine whose editors select for publication the best examples of creative writing submitted by the student body.

The Cauldron — The combined senior class publishes annually a college yearbook, **The Cauldron**. It is distributed without charge to the seniors and contains a complete review of the college year with class histories, pictures of all seniors, of the faculty, and of undergraduate groups, as well as a miscellany of snapshots and drawings contributed by students.

Student Council

Student government of the Colleges at Northeastern University is vested in the Student Council, composed of elected representatives from the various classes. The Council is the authority on all matters relating to student policies not definitely connected with classroom procedure. It has jurisdiction, subject to faculty approval, over all such matters as customs, privileges, and campus regulations.

Student Union

The purpose of the Northeastern Student Union is to deepen the spiritual lives of Northeastern men and women through the building of character, to create and promote a strong and effective Northeastern University spirit in and through a unified student body, to promote sociability, and to emphasize certain ethical, social, civic, intellectual, and avocational values.

All students are encouraged to participate in the activities of the Union, no matter what their religious faith, as the work of the Union is entirely nonsectarian.

The Chapel Committee assists the Dean of Chapel and Chapel Choir adviser in conducting the voluntary and interfaith services held on Wednesdays from 8:20 a.m. to 8:45 a.m. in the Bacon Memorial Chapel. This committee also has charge of special chapel programs at the Christmas and Eastern seasons.

Clubs

To assist in the promotion of social, cultural, and intellectual advancement through informal channels, many clubs are sponsored. The following partial list is given to indicate the variety of opportunities available.

Art Club — This group is open to all Northeastern students interested in sketching or painting. Weekly meetings are organized to provide instruction and guidance in pencil and charcoal sketching, water coloring, and oil painting. The regular program includes several field trips for practice in sketching or painting seascapes and landscapes. Several exhibitions of the work of members are held during the year.

Auto Club — Members conduct special programs for sports car and antique auto enthusiasts.

Biology Club — The Biology Club (Nu-Beta) serves to stimulate interest in the biological sciences by presentations of motion picture films and lectures, and participation in field trips. Membership is open to all students.

Debating Society — The purpose of the Debating Society is "to foster and promote an interest and facility in formal argumentation; to develop an impartial, unbiased, and intellectual consideration of questions and issues of current interest; and to sponsor intercollegiate relationships and competition in the debating field." Membership is open to all students of the Colleges.

Husky Key — This organization for the promotion of school spirit provides special services at athletic events and for visiting teams and other groups.

Hus-Skiers and Outing Club — The purpose of the Hus-Skiers and Outing Club is to conduct an integrated program of ski activity and week-end outings. A tournament and carnival are held near the close of the winter season, in which all members are eligible to take part. The Club holds charter membership in the New England Intercollegiate Ski Conference. Skiing is recognized as a minor sport.

International Relations Club — Founded for the purpose of studying and discussing those current national and international events and issues which vitally concern our American life and institutions, the Club maintains contacts with similar organizations in other colleges.

Jazz Society — This group is primarily interested in contemporary American music and sponsors festivals, small "live" concerts, speakers, and sessions for listening to recent recordings.

Mathematics Club — Members discuss topics of mathematical interest which are either outside or beyond the scope of the regular mathematics courses.

Military Affiliated Radio System (MARS) — A world-wide organization of amateur radio operators sponsored by the U.S. Army Signal Corps. It operates station AAIWAS at Northeastern University. Membership is open to all "ham" operators who have or desire to obtain amateur licenses. It co-operates with the Radio Club.

Musical Clubs — The Office of Student Activities sponsors musical clubs such as the following: concert orchestra, band, chorus, and dance orchestra, for which all students with musical ability are eligible. Membership in the various musical clubs is attained by competitive effort.

Political Clubs — These clubs provide students with opportunities to become better acquainted with current political issues and to hear outstanding speakers from the national and state political organizations.

Psychology Society — An organization in which interests in technical psychology are pursued. The membership is open principally to majors in the field of psychology, but this does not preclude from participation any student who has an active interest in the subject.

Radio Club — One of the most popular undergraduate activities is the Radio Club. Members are provided opportunity for code practice and are encouraged to obtain their amateur licenses. The Club owns and operates station W1KBN, a short-wave transmitter, located in the Radio Laboratory in the penthouse of Hayden Hall. Meetings are held about once a month for the discussion of

technical matters. Practicing radio engineers are frequently invited to address the club at evening meetings, when students in both divisions may attend.

Rifle Club — Recognized as a minor sport, the Club offers opportunities for intercollegiate competition on the varsity level, as well as intramural matches for various club teams. ROTC cadets participate in Army area matches and the women's rifle team in National Rifle Association competition.

Silver Masque — This club affords an opportunity for those students interested in dramatics to participate in several productions during the college year. Qualification for the cast and for positions on the business staff is through competition under the direction of the faculty adviser.

Sociology Club — This organization provides an opportunity for sociology majors, as well as interested students from other fields, to join with faculty members of the department to explore matters of common interest that pertain to the field.

Table Tennis Club — Games are played weekly and tournaments held periodically.

Underwater Society — This group is concerned with marine exploration. It organizes scuba diving trips and conducts geologic and archaeological surveys.

University Band — Open to all students with musical ability, it performs at University events such as convocations, football, basketball, and hockey games, and at parades.

Women's Societies — The social activities for women are centered in two societies, Omega Sigma and Gamma Delta. Each society has its own program of banquets, teas, informal parties, general meetings, and social service projects. The societies co-sponsor a mid-winter dance and other similar activities. One of the primary objectives of the societies is to offer the women students at Northeastern University opportunity for closer friendship, for spirited participation in wholesome activity, and for leadership development.

WNEU (Campus Radio) — This organization operates the University's radio station WNEU, broadcasting news bulletins and music to certain student areas on the University campus and to Northeastern dormitories and fraternity houses.

Yacht Club — The Yacht Club is a member of the Intercollegiate Yacht Racing Association. The club participates in regattas held in the Charles River Basin and also at other colleges. Sailing is recognized as a minor sport.

Professional Organizations

The purpose of student chapters of national professional societies is to provide an interchange of information on technical subjects, new developments, and professional standards. The chapters at Northeastern hold regular meetings and social affairs, and send representatives and delegations to outside meetings.

The following professional societies are open to upperclassmen in the respective professional fields:

Accounting Society — All students interested in accounting are invited to become members of this club. Problems involving accounting are presented and

discussed at club meetings. Upperclassmen present problems arising out of thesis or co-operative work experience, and able practitioners from the professional world are invited to present papers and lead the student discussions.

Advertising Club — Affiliated with the Junior Advertising Club of Boston and with the National Industrial Advertisers' Association through the Technical Advertising Association of Boston. Members of this club are committed to the development of professional associations and interests.

American Chemical Society — Membership is open to upperclassmen majoring in chemistry or chemical engineering. Meetings are held twice during each term, at which times talks and motion pictures are given on various chemical subjects.

American Finance Association — The purpose of this society is to increase knowledge of the investment field by providing opportunities for discussions and by arranging for supplementary talks by outstanding personalities in the professional world of finance. All interested students are welcome at the meetings, which are held regularly during each ten-week term.

American Institute of Physics — Membership is open to all students having physics as one of their primary interests. Meetings are held regularly. The program consists of student and guest speakers, demonstrations, films, and tours through local centers of research.

American Marketing Association — Students in the College of Business Administration maintain this chapter for the purpose of enhancing the professional development of its members. Meetings are held each ten-week period, at which executives from Greater Boston firms discuss current issues in the field.

American Pharmaceutical Association (Student Chapter) — The College of Pharmacy sponsors a Student Chapter of the American Pharmaceutical Association. The Chapter is an active organization, founded to promote, in the broadest and most liberal manner, pharmacy as a science and as a profession, according to the objectives of the Constitution of the American Pharmaceutical Association, so that students may be better prepared to serve pharmacy in the future. Guest lecturers of national and state prominence address the Chapter during the year.

Armed Forces Communications and Electronics Association (AFCEA) — This is a national professional society composed of the leaders of industry and of the departments of the Armed Forces concerned with communications, electronics, and photography. It is sponsored by the Signal Corps branch of ROTC. Membership is open to any student who is interested in communications, electronics, and photography. They take many field trips and have prominent speakers at regular meetings.

Engineering Societies, National — Students in the several professional curricula of the College of Engineering operate Northeastern University sections of the appropriate national professional societies. Chief among these are the following:

   American Society of Civil Engineers
   Boston Society of Civil Engineers
   American Society of Mechanical Engineers
   American Institute of Chemical Engineers

American Institute of Industrial Engineers
Institute of Electrical and Electronic Engineers
Society of Women Engineers

Members of the engineering faculty who hold membership in the parent organizations serve as advisers to these student groups. Meetings are held regularly, and practicing engineers are invited to address the sections. Occasionally appropriate motion pictures are shown, or the group visits some current engineering project in the vicinity of Boston. The College of Engineering encourages these student sections of the technical societies in the belief that they provide a wholesome medium for social intercourse as well as a worthwhile introduction to professional life.

National Education Association — A professional association for college students actively preparing to teach. Its aim is to provide experiences which help develop professional awareness and competency and assist in guiding students into proper areas of specialization.

Society for the Advancement of Management — The purposes of this professional society are to stimulate student interest in the profession of management and to present to the student a picture of management problems and functions through lectures, plant visitations, group discussions, and the like. Membership is open to all upperclassmen interested in the profession of management. The N.U. Student Chapter is sponsored by the Boston Chapter of S.A.M.

Society of American Military Engineers (SAME) — This is a national professional society composed of civilian industrial leaders and officers of the Armed Forces concerned with military and industrial construction and military engineering. Membership is open to all engineering students. It is sponsored by the Corps of Engineers branch of ROTC. They take many field trips and have prominent speakers at regular meetings.

Professional Pharmacy Fraternities

Alpha Zeta Omega — A national pharmaceutical fraternity, installed Upsilon Chapter in 1951.

Delta Sigma Theta — An international fraternity of the healing arts, embracing members in Medicine, Dentistry and Pharmacy. The local chapter was installed in 1953.

Rho Pi Phi — An international pharmaceutical fraternity, installed Tau Chapter in 1957.

Kappa Psi — A national pharmaceutical fraternity, installed Gamma Lambda Chapter in 1958.

ROTC Honorary Societies

Pershing Rifles — This is an honorary society open to ROTC freshman and sophomore cadets who distinguish themselves. The national society was founded in 1894 at the University of Nebraska and now has about 130 chapters at colleges and universities throughout the country. Company A, 12th Regiment, at Northeastern University was chartered in 1952. It encourages promotes, and develops citizenship and the highest ideals of the military pro-

fession. The Rifles have a crack drill team that participates at University and local civil ceremonies.

National ROTC Band Association — This is an honorary society open to members of the ROTC Band. It provides recognition for the contributions of ROTC bandsmen to the Cadet Brigade. The Association encourages the development of leadership and character while promoting the highest standard of musicianship. The Band Association sponsors the participation of the ROTC bandsmen in community and civic functions.

Scabbard and Blade — This is the ROTC cadet officers' honorary society. The National Society was founded in 1905 at the University of Wisconsin, and there now are over 128 chapters at colleges and universities throughout the United States. Company H, 11th Regiment, at Northeastern was chartered in 1954. Membership is restricted to advanced course cadets and is by invitation only. Scabbard and Blade is a most important ROTC student activity. It sponsors the Annual Military Ball.

Class Organization and Activity

Each of the classes in the Basic Colleges elects its officers and carries on activities as a class. Dances are sponsored by the classes at regular periods throughout the year. One of the highlights of the social program is the Junior Promenade, held each spring at one of the Boston hotels.

Senior Week is the culmination of five years of class activities. Informal dances, beach outings, a moonlight cruise, and the formal Senior Promenade are held during the week prior to Commencement.

Convocations

These meetings are usually held in Symphony Hall. There is a President's Convocation for Freshmen during the Orientation Period. Meetings for the entire University, known as the Fall Convocation and the Honors Convocation, are held during the year on Wednesdays from 12 to 1, and bring before the student body some of the ablest and foremost leaders of our country. Attendance is compulsory. Other convocations may be announced during the year. These meetings are under the direction of the Dean of Students' Office.

Nonsectarian Chapel Services

The period from 8:20 a.m. to 8:45 a.m. on Wednesdays throughout the year is reserved by the University for nonsectarian chapel services. Northeastern was founded upon inclusive and broad religious principles, and spiritual values are regarded as indispensable to good citizenship. Attendance at chapel services is therefore encouraged though not required.

The Bacon Memorial Chapel is located in the Ell Student Center. Adjoining it the Dean of Chapel has his office, where he is available to all students upon appointment.

For over three decades eminent leaders of religion — ministers, priests, and rabbis alike — have participated in this interfaith service. A chapel choir is led by the director of music, and students of various religious backgrounds assist in the order of worship.

The Northeastern chapel program enjoys the distinction of having recognition through charter membership in the National Association of College and University Chaplains.

Social Fraternities

Twelve Greek letter fraternities are currently chartered by Northeastern University. Each fraternity is provided with a faculty adviser who is responsible for the proper administration of the fraternity house under the rules and regulations established by the faculty. The fraternities in the order of their establishment are as follows:

1. Beta Gamma Epsilon	5. Phi Beta Alpha	9. Gamma Phi Kappa
2. Alpha Kappa Sigma	6. Phi Gamma Pi	10. Phi Alpha Rho
3. Nu Epsilon Zeta	7. Phi Sigma Kappa	11. Zeta Gamma Tau
4. Alpha Epsilon Pi	8. Tau Epsilon Phi	12. Theta Rho Epsilon

Elected representatives from each fraternity make up an Interfraternity Council, a body which has preliminary jurisdiction over fraternity regulations. Its rulings are subject to the approval of the Committee on Student Activities.

Women's Organizations

In addition to Omega Sigma and Gamma Delta, the women's societies, Northeastern University also has five sororities: Chi Pi Epsilon, Delta Pi Alpha, Kappa Theta Xi, Theta Sigma Tau, and Pharmacy Sorority, Lambda Kappa Sigma.

Special Interest groups for women students include the Girls' Sports Association and the Modern Dance Group.

Reserve Officers' Training Corps

General Objectives

The Department of Military Science is the instructional department of the University which administers the Reserve Officers' Training Corps Program (ROTC). The Reserve Officers' Training Corps is regarded by Northeastern University as an integral part of its educational program, and the aim is to make ROTC available on a voluntary basis to all male undergraduate students of the Colleges who are otherwise qualified. The University believes that the leadership, citizenship, and military training available to students taking ROTC is beneficial in their over-all development as future leaders and, therefore, encourages enrollment. The courses outlined in this section, accordingly, are available to students in the Basic Colleges of the University.

The Reserve Officers' Training Corps of the United States Army exists for the purpose of developing officers — leaders of men. It offers courses of instruction leading to a commission as a second lieutenant in the United States Army Reserve or the Regular Army. The mission of ROTC is to have ready in time of national emergency a corps of educated, trained leaders for our nation. The Northeastern ROTC is an Army, Senior Division, Class CC (Civilian College) unit with branches in the Corps of Engineers and Signal Corps. Enrollment in ROTC is entirely elective.

The greatest benefit to the individual from ROTC training is its development of leadership qualities. Leadership — the ability to organize and direct the activities of others — is in high demand by business, industry, the social fields, the military service — almost all human enterprises.

Although the Department of Military Science is an instructional department of the Colleges, it is also interested in many extracurricular student activities as part of its over-all leadership development program. There exists, therefore, close association with the Department of Student Activities, and activities associated with ROTC (listed under "Professional Organizations" and "Clubs") have Army officers assigned by the University as Faculty Advisers.

Also, ROTC students who gain positions of leadership on the campus in activities not directly associated with ROTC, such as publications, dramatics, athletics, and student government, have thereby displayed leadership achievements which are valuable in ROTC training and which can be recognized in ROTC leadership potential ratings. The over-all progress of a student in the University, as well as his military progress, is always considered in ROTC training.

Among the ROTC activities, the Annual Military Ball is one of the most colorful campus events of the year. The Fall Awards Ceremony in honor of the University President, at which he presents ROTC scholarships, and the Spring Awards Ceremony, at which Distinguished Military Student badges and other awards are presented by University officials and representatives of donor societies, also are colorful events open to the entire "University Family."

The staff and faculty of the Department of Military Science consist of officers, noncommissioned officers, and civilians, assigned to Northeastern University by the Department of the Army, and of civilians furnished by the University. All military members are especially selected because of professional competence, educational background, and ability to fit into the "University Family." Officers are individually nominated for assignment to the University and are assigned only after records have been reviewed and each individually has been accepted by the University.

The Department Chairman and Professor of Military Science is a United States Army officer whose appointment has been mutually agreed upon by the University President and the Department of the Army.

Courses of Study

The program of instruction consists of a basic course and an advanced course, presented in two branches of the United States Army, Corps of Engineers and Signal Corps. Only Army ROTC is available at Northeastern. The basic course (MS I & MS II) requires three hours of instruction per week during the freshman year and four hours during the sophomore year. The Corps of Engineers limits its ROTC to students enrolled in engineering courses, but the Signal Corps, while especially desiring electrical and other engineering students, also accepts nontechnical students for ROTC. There are many command, administrative, personnel, business management, and other position openings in the Signal Corps for nontechnical college graduates.

At Northeastern, students majoring in civil, mechanical, and industrial engineering are enrolled for Corps of Engineers instruction, while those majoring in electrical and chemical engineering and all nonengineering majors in the Colleges of Business Administration, Education, Pharmacy, and Liberal Arts are enrolled for Signal Corps instruction.

The basic course includes instruction common to all branches of the Army. Students completing the basic course are awarded a "Military Training Certificate" as evidence of successful completion of this course. This certificate indicates one's patriotic accomplishments and has positive value in many ways. Branch instruction starts with the advanced course for Corps of En-

gineers or Signal Corps. The advanced course (MS III & MS IV) is presented during the middler, junior, and senior years. Graduates of the advanced course receive commissions as second lieutenants in the U.S. Army Reserve or Regular Army.

Enrollment in the ROTC Basic Course

Enrollment in the ROTC Basic Course is voluntary and is open to all male undergraduate students of the Basic Colleges who are physically qualified. The Basic Course may be entered only at the beginning of the freshman year except for veterans and certain students who have had Junior ROTC, for whom a portion of the Basic Course may be waived.

Eligibility for the Advanced Course

The ROTC advanced course is available to male undergraduate students of the Basic Colleges who complete the basic course, or to honorably discharged veterans whose service can be substituted for the basic course, who: are citizens of the United States and will not have reached 28 years of age at the time of commissioning; successfully complete such survey and general screening tests as may be prescribed; have three academic years to complete for graduation (two for full time); are selected by the Professor of Military Science and the University within quotas available in any year; execute a written contract with the Government; and successfully complete a U.S. Army physical examination.

Eligibility for ROTC Flight Training

Northeastern University was among the original group of universities and colleges in the United States at which the Army ROTC Flight Training Program was introduced in 1956. This training is available during the senior year to specially selected cadets who successfully complete U.S. Army Aviator aptitude and physical tests. Flying instruction is conducted on an extracurricular basis by civilian flying schools, under contract to the University and the U.S. Army. An Army faculty member supervises the program. Cadets successfully completing the course receive a Federal Aviation Agency Private Pilot's certificate.

Veterans

Honorably discharged veterans (enlisted) may be enrolled in ROTC with one or both years of the basic course waived, depending on prior service. They must be co-aligned in ROTC with other members of their class in the University curricula. Veterans are a distinct benefit to the Corps of Cadets because their actual experiences lend color to the program and help to orient cadets without such service. They are especially desired and are normally appointed cadet noncommissioned officers or officers upon enrollment. Certain credits are available to veterans depending upon service. Former commissioned officer veterans are not eligible for ROTC. However, if they are Reserve officers, they can earn inactive duty credits by participating in ROTC on a free-time basis. They may apply to the Professor of Military Science.

Transfer Students

A student transferring to Northeastern University from another institution where ROTC similar to that at Northeastern has been taken, is allowed credit for his work. The student's records are obtained from his former Professor of Military Science. Such a transfer student must be co-aligned in ROTC with other students in his class.

Uniforms and Equipment

An Army officer's type uniform is issued without cost to ROTC students in the basic course. Advanced-course students are individually fitted to a uniform, which becomes their personal property upon commissioning, and they continue to wear it as an officer after graduation. The Government furnishes $100 toward this uniform, and the student pays a small additional charge. All other equipment, textbooks, etc., required for instruction are provided without charge throughout the five-year program. These items remain the property of the Government, and the students must safeguard them and use them in accordance with University and ROTC regulations. A $10 deposit is required temporarily from all basic-course students enrolling in ROTC until uniforms and property are returned in good condition. Any loss or damage to ROTC uniforms and equipment, exceeding the deposit, will be charged to the student.

Academic Credit

Academic credit is given for all ROTC work — a total of 24 hours during five years. The basic course may be substituted for physical education as a prerequisite for graduation. Eighteen credit hours are granted for the advanced course, and certain of these may be substituted for upper-class academic work as approved by the Dean up to a maximum of 12 credits. Thus, time spent in the advanced course is not all over and above the regular curriculum. Many of the credit hours can be substituted for other elective academic work.

Pay and Other Benefits

ROTC benefits are both tangible and intangible. "Pay," earned by advanced-course students, is actually a nontaxable allowance for subsistence at the rate of $.90 daily. It is paid in increments of $27 monthly during actual advanced-course instruction and also during co-operative work terms up to a total of 595 days. Camp pay is $78 monthly over and above housing, messing, and medical care, which are free at camp. Transportation to and from camp is paid at the rate of $.05 per mile. Total income from ROTC amounts to over $700 paid over the final three years of ROTC. This (over $2 per hour for the 300 hours of the advanced course) is an important supplement to co-operative work income in offsetting tuition costs. Cadets also compete for ROTC scholarships with a total value of $1,000.

Intangible benefits, especially leadership development, are even more important than "pay" in the long run. The ROTC student is trained to be confident and self-reliant. For the final three years he gets a concentrated course in command, leadership, and personality development under Regular Army officers who have been selected for their abilities in this respect. Cadets respond quickly to this personalized training. They learn to stand up and speak

before classmates. This helps them to obtain positions of leadership on the campus, in the community, and at their places of business.

As cadets progress, they participate in troop command and management, in public speaking, in exercises requiring understanding of practical and applied psychology, and in other similar fields for the development of leadership and personality. Each year brings increased responsibilities. In the senior year, cadets are promoted to positions of high leadership in the Corps of Cadets. They command the brigades, battalions, companies, and platoons, or serve in Cadet Grades from Lieutenant to Brigadier-General. Top leaders in ROTC usually are top leaders on the campus.

There are many social activities and benefits associated with ROTC. Cadets are eligible for selection to honorary military societies such as Pershing Rifles and Scabbard and Blade. ROTC students compete for medals and other academic and leadership awards. They associate with many other cadets in the University ROTC Band, the University Rifle Club (Varsity, Freshman, Girls' and ROTC Rifle teams), the Military Affiliate Radio System for "ham" radio operators, student chapters of national professional societies sponsored by the Armed Services, such as the Armed Forces Communications and Electronics Association and the Society of American Military Engineers. The ROTC also sponsors a Counter Guerrilla Group.

Draft Deferments

Public Law 51 (Universal Military Training and Selective Service Act of 1951 as amended by the Reserve Forces Act of 1955) permits students enrolled in ROTC, who are expected to attain appointments as commissioned officers in the Army Reserve, to be deferred from service for as long as they remain in good standing. ROTC deferment remains in effect until graduation or withdrawal from the University. An ROTC deferment is a matter of law and is not dependent upon conditions pertaining to any one Selective Service Board at any one time.

Distinguished Military Students

There are military honors for ROTC graduates similar to academic honors for regular graduates. Honor graduates of ROTC are called Distinguished Military Graduates. If physically qualified and they apply for it, they can be commissioned in the Regular Army, instead of the Army Reserve, and enter into a Regular Army career exactly the same as graduates of the United States Military Academy at West Point. This is a splendid opportunity for those who are interested in the many advantages of a Regular Army career. However, since ROTC is primarily for students who pursue civilian careers, the Distinguished Military Graduate who does not desire a Regular Army career benefits from his Commencement military honors as he would from any other Commencement honors. This honor is limited to about 15% of the senior class.

Cadets are eligible to be designated Distinguished Military Students in their junior year, when they possess outstanding qualities of leadership, high moral character, and definite aptitude for the military service; have attained an academic standing in the upper half of the class and in the upper third of their

ROTC class; and, further, have demonstrated leadership ability through participation in recognized campus activities.

The Army as a Career

By following any curricula leading to a degree, and by completing the ROTC Program, a student may qualify for a full-time career in the Regular Army. Cadets who have been designated Distinguished Military Students may apply in September of the senior year for an appointment in the Regular Army. They are notified by mid-December as to selection subject to graduation, designation as Distinguished Military Graduates, and physical qualification. They then become Regular Army officers, with all conditions and opportunities for graduate education, etc., exactly the same as for graduates of the U.S. Military Academy at West Point. There are many advantages and opportunities in a Regular Army career. Pay and allowances compare favorably with civilian pay, and the retirement pay and benefits, after 30 years, are much higher than for most other careers. Since it is never too early to begin planning a career, students who are interested in a Regular Army appointment should make that fact known to the Professor of Military Science as soon as possible.

An Army career as a Reserve officer on extended Active Duty also is possible. Many graduates do not request a Regular Army appointment originally, but find Army service enjoyable and satisfying while serving their obligated tours of Active Duty. Those officers who request continuation and are accepted, serve in the Active Army as Reserve officers, with the same pay, responsibilities, and opportunities for promotion as Regular Army officers.

Most ROTC graduates pursue civilian careers and serve only limited tours of Active Duty. However they, too, can benefit from their part-time Army careers by participating in the Reserve Unit training activities during evenings and at summer camp. They receive pay and accrue credit towards retirement at age 60 (after 20 years' service). Such part-time careers may result in eligibility for retired pay each month for the rest of their lives. This is a real financial security benefit, which is equivalent to a sizable annuity and is worthwhile for any person to seek.

Military Science

61.01 Military Science I   1 Cl.; 2 Lab.; 1 Cr.
Military fundamentals and objectives required of all persons entering military service; organization of the Army and ROTC leadership; care of the uniform and rifle; military courtesy, discipline, and drill.

61.02 Military Science I   3 Cl.; 1 Cr.
U.S. Army and National Security; counterinsurgency operations.

61.03 Military Science I   2 Cl.; 1 Lab.; 1 Cr.
Instruction in individual weapons and marksmanship; drill and leadership techniques.

61.10 Military Science II   3 Lab.; 1 Cr.
Training in special drill and leadership techniques.

61.11 Military Science II   2 Cl.; 2 Lab.; 1 Cr.
Principles of map and aerial-photograph interpretation; basic tactics. Brigade drill.

61.12 Military Science II   4 Cl.; 1 Cr.
Military history; basic tactics and techniques.

61.20 Military Science III   2 Cl.; 0 Cr.
Study of theory of signal field communications system engineering and communications materiel.

61.21 Military Science III   3 Cl.; 2 Lab.; 3 Cr.
Study of theory of signal field communications systems engineering and communications materiel. Brigade drill.

61.22 Military Science III   4 Cl.; 3 Cr.
Study of military teaching methods, leadership techniques, and service orientation.

61.30 Military Science III   2 Lab.; 0 Cr.
Training in drill and leadership techniques.

61.31 Military Science III   3 Cl.; 2 Lab.; 3 Cr.
Study of the theory of signal field communications system engineering and communications materiel. Leadership training in brigade drill.

61.32 Military Science IV   4 Cl.; 3 Cr.
Fundamentals of military logistics; Army staff relationships; Army administration.

61.40 Military Science IV   3 Cl.; 0 Cr.
Study of military logistics; automatic data processing.

61.41 Military Science IV   3 Cl.; 2 Lab.; 3 Cr.
Basic concepts of signal communications system engineering. Brigade drill.

61-42 Military Science IV 4 Cl.; 3 Cr.
Principles of military law; study of unit operations; role of U.S. in world affairs.

61.60 Military Science III 2 Cl.; 0 Cr.
Principles and techniques of field fortifications and camouflage construction.

61.61 Military Science III 3 Cl.; 2 Lab.; 3 Cr.
Mine warfare; military structures to include fixed and floating bridges. Brigade drill.

61.62 Military Science III 4 Cl.; 3 Cr.
Training in leadership techniques; principles of military teaching; counter-insurgency; service orientation.

61.70 Military Science III 2 Lab.; 0 Cr.
Training in drill and leadership techniques.

61.71 Military Science III 3 Cl.; 2 Lab.; 3 Cr.
Study of construction materials and computations and maintenance of construction. Brigade drill.

61.72 Military Science IV 4 Cl.; 3 Cr.
Study of the supply of engineer units; command and staff organization; basic concepts of Army administration.

61.80 Military Science IV 3 Cl.; 0 Cr.
Study of military explosives; Army logistics.

61.81 Military Science IV 3 Cl.; 2 Lab.; 3 Cr.
Study of roads and airfield construction and buildings and utilities activities. Brigade drill.

61.82 Military Science IV 3 Cl.; 1 Lab.; 3 Cr.
Principles of military law, operations of military courts; role of U.S. in world affairs; operations of units.

BASIC ROTC

FIRST YEAR

No.	TERM 1 Course	Cl.	Cr.	No.	TERM 2 Course	Cl.	Cr.	No.	TERM 3 Course	Cl.	Cr.
61.01	Mil. Sci. I Org. Army & ROTC	1	1	61.02	Mil. Sci. I US Army & Mat'l Sec.; Counterin- surg. Op.	3	1	61.03	Mil. Sci. I Weap. & Marks- man.	2	1
	Leadership Lab.	(2)	1						Leadership Lab.	(1)	
		1(2)	1			3	1			2(1)	1

SECOND YEAR

No.	TERM 4* Course	Cl.	Cr.	No.	TERM 5 Course	Cl.	Cr.	No.	TERM 6 Course	Cl.	Cr.
61.10	Mil. Sci. II			61.11	Mil. Sci. II Map & Aer. Photo Read.; Basic Tactics	2	1	61.12	Mil. Sci. II Mil. History & Basic Tac. & Tech.	4	1
	Leadership Lab.	(3)	1		Leadership Lab.	(2)					
		(3)	1			2(2)	1			4	1

SIGNAL CORPS ADVANCED ROTC

THIRD YEAR

No.	TERM 7* Course	Cl.	Cr.	No.	TERM 8 Course	Cl.	Cr.	No.	TERM 9 Course	Cl.	Cr.
61.20	Mil. Sci. III Intro. Sig. Fld. Comm. Sys. Eng.	2	0	61.21	Mil. Sci. III Sig. Fld. Comm. Sys. Eng. & Comm. Mat.	3	3	61.22	Mil. Sci. III Leader. & Meth. of Instr.	4	3
					Leadership Lab.	(2)					
		2	0			3(2)	3			4	3

FOURTH YEAR

No.	TERM 10* Course	Cl.	Cr.	No.	TERM 11 Course	Cl.	Cr.	No.	TERM 12 Course	Cl.	Cr.
61.30	Mil. Sci. III Leadership Lab.	(2)	0	61.31	Mil. Sci. III Sig. Fld. Comm. Sys. Eng.	3	3	61.32	Mil. Sci. IV Mil. Log.; Army Adm., Staff	4	3
					Leadership Lab.	(2)					
		(2)	0			3(2)	3			4	3

FIFTH YEAR

No.	TERM 13* Course	Cl.	Cr.	No.	TERM 14 Course	Cl.	Cr.	No.	TERM 15 Course	Cl.	Cr.
61.40	Mil. Sci. IV Mil. Log.; Auto. Data Proc.	3	0	61.41	Mil. Sci. IV Sig. Tac. & Tech.	3	3	61.42	Mil. Sci. IV Mil. Law; Oper.; Role of US in World Affairs	4	3
					Leadership Lab.	(2)					
		3	0			3(2)	3			4	3

CORPS OF ENGINEERS ADVANCED ROTC

THIRD YEAR

No.	TERM 7* Course	Cl.	Cr.	No.	TERM 8 Course	Cl.	Cr.	No.	TERM 9 Course	Cl.	Cr.
61.60	Mil. Sci. III Fort. & Camoufl.	2	0	61.61	Mil. Sci. III Mine Warfare; Mil. Struct.	3	3	61.62	Mil. Sci. III Mil. Teach. Prin.; Leadership	4	3
					Leadership Lab.	(2)					
		2	0			3(2)	3			4	3

FOURTH YEAR

No.	TERM 10* Course	Cl.	Cr.	No.	TERM 11 Course	Cl.	Cr.	No.	TERM 12 Course	Cl.	Cr.
61.70	Mil. Sci. III Leadership Lab.	(2)	0	61.71	Mil. Sci. III Constr. Mat.; Conc. & Bit. Constr.; Constr. Comp.	3	3	61.72	Mil. Sci. IV Eng. Log.; Com- mand & Staff; Army Adm.	4	3
					Leadership Lab.	(2)					
		(2)	0			3(2)	3			4	3

FIFTH YEAR

No.	TERM 13* Course	Cl.	Cr.	No.	TERM 14 Course	Cl.	Cr.	No.	TERM 15 Course	Cl.	Cr.
61.80	Mil. Sci. IV Mil. Explosives; Log.	3	0	61.81	Mil. Sci. IV Roads & Airflds.; Bldgs. & Util.	3	3	61.82	Mil. Sci. IV Oper. Mil. Law; Role of US in World Affairs	3	3
					Leadership Lab.	(2)			Leadership Lab.	(1)	
		3	0			3(2)	3			3(1)	3

Note: Div. A curriculum is listed. Div. B differs with a spring rather than a fall drill term and sequence of instruction in 10-week terms is reverse of Div. A. Therefore, transfers between divisions require individual consideration.

*Summer term—5 weeks.   ( ) indicate drill and practice.

General
Information

Policy on Changes of Program

The University reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time pursuant to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

Textbooks and Supplies

The Northeastern University Bookstore, located on the ground floor of Richards Hall, is a department of the University and is operated for the convenience of the student body. All books and supplies which are required by the students for their work in the University may be purchased at the Bookstore.

Part-Time Work

Students who find it necessary to accept part-time jobs while attending college may obtain such work through the Dean of Students' Office.

Students are not justified in assuming that the University will take care of their expenses or guarantee to supply them with work sufficient to meet all their needs.

A student should have funds adequate to meet the expenses of the freshman year. They should amount to at least the first year's tuition plus books and supplies, and room and board for thirty weeks.

GRADES AND EXAMINATIONS

Examinations

Examinations covering the work of the term are usually held at the close of each term. Exceptions may be made in certain courses where, in the opinion of the instructor, and with the approval of the Dean of the College concerned, final examinations are not necessary.

Condition Examinations

Condition examinations are usually given once each year for each division. The charge is three dollars ($3) for each condition examination.

The responsibility for the removal of a condition rests with the student, who is required to ascertain when and how the condition can be removed.

A student may take only one condition examination to remove a failure in a given course.

Special Final Examinations

Students who have received permission to make up missed final examinations will be charged a single fee of five dollars ($5) covering all of the examinations missed within any one final examination period during a given period of illness.

Senior Condition Examinations

No condition examinations in last-term senior courses are offered at the end of the last term. This means that a failure in a last-term senior course cannot be made up before Commencement.

Grades

A student's grade is officially recorded by letter as follows:

A   outstanding attainment
B   good attainment
C   satisfactory attainment
D   poor attainment
F   failure
I   incomplete
WP Withdrew from course — passing
WF Withdrew from course — failing

A general average of D is not acceptable and will not allow a student to continue at Northeastern University.

A student has one opportunity to convert an F grade to a D through the taking of a condition examination.

An I or Incomplete grade is used for a temporary grade to show that the student has not taken the final examination in the course. The letter grade following the I is the student's final grade in the course if he does not take the

missed final at the regularly scheduled time after having been granted permission to do so. No I grade is given in 5-week terms.

Students who acquire more than three uncleared failures or whose weighted average for the year is below 1.4 will not be permitted to register for advanced work.

The responsibility for the removal of a condition rests with the student, who is required to ascertain when and how the condition can be removed.

Dean's List

A Dean's List, issued at the end of each term, contains the names of upperclass students who have a 3.0 weighted average in all subjects with no grade below C during the preceding period. Freshmen who meet the same standards in their work are included on a Freshman Honor List. No student subject to disciplinary action is eligible for either list.

Reports on Scholastic Standing

Reports for all students are issued at the end of each grading period. Questions relative to grades are to be discussed with the student's faculty adviser.

Students are constantly encouraged to maintain an acceptable quality of college work. Parents and students are always welcomed by the college officers and faculty advisers for conference upon such matters.

Parents or guardians will be notified whenever students are advised or required to withdraw from the University. If parents so request, report cards will be sent to them instead of to the student.

GENERAL CONDUCT

It is assumed that students come to the University for a serious purpose and that they will cheerfully conform to such regulations as may from time to time be made. Damage to any building or to any of the furniture, apparatus, or other property of the University, will be charged to the student or students known to be immediately concerned; but if the persons who caused the damage are unknown, the cost for repairs may be assessed equally upon all the students of the University.

Students are expected to observe the accepted rules of decorum, to obey the regulations of the University, and to pay due respect to its officers. Conduct inconsistent with the general good order of the University or persistent neglect of work may be followed by dismissal; if the offense be a less serious one, the student may be placed upon probation. The student so placed upon probation may be dismissed if guilty of any further offense.

It is desired to administer the discipline of the University so as to maintain a high standard of integrity and a scrupulous regard for truth. The attempt of any student to present any work which is not his or her own, or to pass any

examination by improper means, is regarded as a most serious offense and renders the offender liable to immediate expulsion. The aiding and abetting of a student in any dishonesty is also held to be a grave breach of discipline.

Attendance

Students are expected to attend all exercises in the subjects they are studying unless excused in advance.

Absence from regularly scheduled exercises in any subject will seriously affect the standing of the student. It may cause the removal of the subject or subjects from the student's schedule.

Laboratory work can be made up only when it is possible to do so during hours of regularly scheduled instruction.

Absences from exercises immediately preceding or following a recess are especially serious and may entail severe penalties.

Attendance at all mass meetings of the student body is compulsory. Exceptions to this rule are made only when the student has received permission from the Director of Student Activities previous to the meeting in question.

Attendance at Commencement

All candidates for a first degree (bachelor or associate) are required to attend Commencement in the year of qualification. First degrees in absentia are awarded only to candidates excused for personal or immediate-family illness, military service, or employment obligations beyond the control of the candidate.

A petition to receive a degree in absentia must be presented to the Dean of the College in which the candidate qualifies. Each petition will be acted upon by the academic Dean involved, the candidate having the privilege of appeal to the Provost.

INFORMATION FOR FRESHMEN

Orientation Period

In order that freshmen may be ready to pursue their academic work with greater composure and be somewhat acclimated before the beginning of scholastic work, three or four days prior to the first term are devoted to a freshman orientation period. All freshmen are required to attend all exercises at the University scheduled during the orientation period.

Orientation Class

All freshmen attend an orientation class once each week for the first fifteen weeks. This class is designed to instruct the student in the traditions, activities, and procedures of the University. Time is devoted to the proper methods

of study for success in college and stress is placed on attitudes for success in later life. About a third of the classes are devoted to techniques and procedures of work under the Co-operative Plan.

Physical Examination

All freshmen must submit a medical report showing evidence of a recent X-ray and physical examination prior to registration. All students failing to submit such a report on the approved form will be assessed a $10 fee and given a special physical examination at the University during the orientation period.

Counselors

At the time of matriculation each freshman is assigned to a personal adviser, a member of the faculty, who serves as an interested and friendly counselor during the perplexing period of transition from school to college. The aim of the freshman advisory system is primarily to guide students through their first year. General counseling is under the direction of the Dean of Freshmen and the Dean of Students, assisted by a clinical psychologist, who handles the diagnosis and remedial treatment of difficult problem cases. Direct counseling of women students is under the supervision of the Dean of Women.

Individual Attention

Attention is given not only to the scholastic problems of the student, but also to personal problems in which advice is needed and desired. The aim is to help the student to the fullest possible personal development.

The college records of all students are periodically analyzed in the light of what may reasonably be expected from them in view of their previous school records, their scores on psychological tests, and all other factors in their situations. If they are not doing their best work, investigations are made to determine and eliminate the causes.

Testing and Counseling Center

The University through its Testing and Counseling Center is prepared to assist students with their educational and vocational planning. The student is encouraged to explore his situation fully in the counseling sessions. Psychological tests are utilized to increase the student's knowledge of himself. This service is available without charge to all regularly enrolled students who desire such assistance.

Vocational counseling services are also available on a fee basis to high school students and to adults.

Career Information Center

The Career Information Center is equipped to provide information about various fields of work and about the educational requirements for these fields. Students may browse through books and pamphlets or may listen to tape recordings on various occupations. Of special interest are the recordings which describe life and activities at Northeastern, as well as others which present information about the various programs of study available at Northeastern.

STUDENT HOUSING

The University maintains dormitory facilities for both men and women students. These are located near the Huntington Avenue campus and accommodate a large portion of the men students who live away from home. The residences for women students are sufficient to provide for all girls who need such accommodations while they are at the University.

Women's Residences

Women's residences, under the supervision of house directors, are maintained by the University. Board (including three meals a day) and room is $300 per ten-week term.

Women students who do not live with their parents or a legal guardian while attending college are required to live in the University residences unless written approval of other arrangements has been obtained in advance from the Dean of Women. Such approval will be granted only in unusual circumstances. Permission to live in apartments or unsupervised rooming houses will be granted only to fifth-year seniors or students who have reached the age of twenty-two.

During co-operative work periods students who cannot live at home or in the University residences make special living plans through the Department of Co-operative Education. If the situation requires that the student live in an unsupervised residence, written approval from parents or guardian must be on file with that department.

Information regarding the women's residences may be obtained from the Director of Housing.

Freshman Men's Residences

The University provides living accommodations in its dormitories for all freshmen living away from home. The cost is $300 for each ten-week term, payable at the beginning of the term, and includes three meals each day. Applications for housing may be filed with the Department of Admissions after a student has been accepted. A dormitory deposit of $50 must accompany the application for housing. The student's receipt of this $50 deposit from the University is his guarantee of a room in the dormitory. (This deposit is non-refundable and will be applied against the first term's board-and-room charges.) Definite notice of room reservations will be sent by the Director of Housing in the late summer.

Students should write to the Dean of Admissions for further information and for the Application for Residence.

Apartments for Upperclassmen

The University maintains a 100-apartment housing unit which accommodates 280 men. Two-, three-, and four-man apartments are available which vary in size from two to four rooms plus bath. Apartments are fully furnished with beds, chairs, desks, stoves, refrigerators, desk lamps, kitchen table, and rugs. The cost is $13 per week per student, payable on a term basis. The cost includes all utilities and bed linen, which is laundered weekly by the University.

Requests for such accommodations can be made by writing the Director of Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on co-operative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

Fraternity Housing

Certain fraternities provide excellent opportunities for room and board for men at reasonable rates. Information regarding these housing facilities may be obtained from the Dean of Men.

Regulations Concerning Off-Campus Housing

Upperclassmen who cannot be accommodated in University residences should contact the Director of Housing, who will offer assistance in procuring off-campus housing. The following rules and regulations apply:

1. Although the University does not encourage students to rent apartments away from the University, it is recognized that this living arrangement is acceptable to some parents. Approval for such housing will be made only under the following conditions:

   a) That the student renting an apartment **is not** a freshman.

   b) Upperclassmen under 21 years of age must see the Dean of Men **before** making apartment arrangements. An apartment request form must be completed by the student, and written approval of the parents is necessary before the request will be acted upon by the Dean.

   c) Upperclassmen over 21 years of age must fill out and file with the Director of Housing an apartment request form. This is important as the Housing Office should know the address of all students not living at home.

2. The Registrar must be notified of the local address of all students.

All questions regarding the availability of housing should be referred to the Director of Housing. All other questions about housing rules and regulations should be directed to the Dean of Men.

Alumni Association

The 27,000 alumni of Northeastern are united under an all-University Alumni Association which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters and Alumni Lounge are located in Rooms 225 and 226 Richards Hall, respectively. The official records and addresses of alumni are maintained in Room 20 of the Forsyth Annex.

The official publication of the Alumni Association, **The Northeastern University Alumnus**, is published quarterly and sent free of charge to all alumni on record.

Through its Vice President for the Alumni Fund, the Association co-operates with the Office of University Development in raising funds from alumni for the Diamond Anniversary Development Program.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of "Professional Promise" awards to outstanding seniors in each of the six Basic Colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of the undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for co-ordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 40 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the alumnae organization, and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the five major sports.
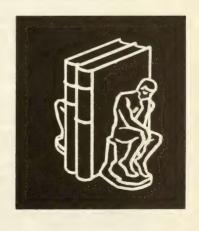
One of the most recent developments in alumni activities is the organization of seminars which are conducted by the Association in co-operation with the University's Center for Continuing Education. The seminars are designed particularly for alumni who have a special interest in current events and the field of adult education.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.

College of Education

Dr. Lester S. Vander Werf, Dean
Thomas J. Cavanagh, Assistant Dean

General Objectives

The College of Education is increasingly and continuously concerned with the quality of those who teach. In the paragraphs that follow, quality is generally described, and the several ways of assessing it are outlined.

Objective 1: Every teacher should learn the value of work.

All students will be expected to take the five-year co-operative program because the staff of the College of Education believes in a regularly patterned program of work experience. Such opportunities are provided in social agencies, libraries, hospitals, and in schools.

Objective 2: Every teacher should be broadly educated.

All students are expected to develop breadth in their program in two ways. First, students will be required to complete certain common course work, Social Science, United States History, American Literature, Public Speaking, Human Development, English. Second, all students must complete a minimum of 18 credits in two areas of knowledge not related to their major field of concentration.

Objective 3: Every teacher should achieve an expertness in some field of knowledge.

Those preparing to teach at the secondary level must choose an academic major from among the following fields: Social Studies, English, Foreign Languages, General Science, Biology, Physics, Chemistry, Mathematics. Those preparing to teach at the elementary level must select an area major from among the following: Social Sciences, Humanities, or Science and Mathematics. The special field of Physical Education is available for others. It is recommended that students have a field of concentration in mind before admission to the University since in most cases the choice will make a difference in their program for the freshman year.

Objective 4: Each teacher should be professionally prepared for the position of his choice.

In addition to their general education and specialized concentration, all students will share some common professional course work with related out-of-class experience and, in addition, will take course work appropriate to their level or field of teaching. Student teaching during the senior year will serve as an opportunity to apply what has been learned in the previous four years.

Objective 5: Each teacher should be an excellent example of American culture.

Students admitted as freshmen are enrolled in the Lower Division of the teacher education program. Thus they will have about two years to estimate their abilities to master college work, to discover the wisdom of their choice of a major field, and to evaluate the strength of their commitment to, and qualifications for, teaching.

Those desiring certification will make application to the Upper Division, preferably early in their second year, and will be expected to submit to a

battery of tests and present such other evidence as the College of Education shall require. Evaluations will be made on intelligence, academic aptitude, verbal fluency, interest in working with young people, and emotional maturity. A serious attempt will be made to assess these factors in their interrelationships rather than as isolated phenomena. Students accepted for the Upper Division standing will be expected to commit themselves to the remaining requirements of the program.

Students who are enrolled in other colleges of the university and who desire teacher certification will be expected to meet generally the requirements of all the above objectives.

Admission Requirements

Important to the future teacher is high ability in the communication skills and adequate strength in the field of special interest. As important as the pattern and quality of an applicant's preparation are the personal qualifications which contribute to success in teaching.

All applicants are expected to have completed the following subject-matter units:

Subject	Units
English (4 years)	3
Mathematics (at least 1 year)	1
Science (at least 1 year)	1
Other college preparatory subjects	6
Electives, not more than	4
	15

Students who wish to major in the Teaching of Science and Mathematics must be able to present these units:

Algebra, through quadratics; Plane Geometry and Trigonometry	3½ units
Physics and Chemistry	2 units

It is desirable for students who wish to major in Physical Education and the Teaching of General Science to be able to present one unit in biology.

Transfers

Students desiring advanced standing from other institutions will not be accepted beyond the Lower Division unless they have, in general, completed the requirements for admission to the Upper Division, including appropriate course work, and the testing program. It is recommended that such students make application not later than May 1 to the Admissions Office of the University for advanced standing the following September.

GRADUATION REQUIREMENTS

Degrees

The College of Education will award the degree of Bachelor of Science in Education to those who successfully complete the program of preparation for teaching at elementary or secondary school level.

Quantitative Requirements

The required courses in each of the undergraduate curricula in the College of Education are indicated on the following pages. Each curriculum requires not less than 214 credit hours of classwork, including 20 weeks of student teaching. At least 36 credit hours will be required in Education, including student teaching.

Elective Courses

Elective courses, approved by the Dean of the College of Education, will be selected by the student from among courses in the Colleges of Liberal Arts and Business Administration.

Qualitative Requirements

Students in the College of Education will be expected to maintain an over-all average of C while doing work of C+ or better in the field of specialization and in the professional sequence in order to be recommended for placement. Students are warned that any failure seriously handicaps their records and must be made up at the earliest opportunity.

Graduation with Honors

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least three years before they may become eligible for honors at graduation.

Co-operative Plan

Upon successfully completing thirty-five weeks of academic work, students in the College of Education are placed on the Co-operative Plan. In this program periods of classroom work alternate with a variety of work experiences in industry, social service agencies, community organizations, etc. This program, which has proved to be of inestimable value in offering students both the theoretical and practical aspects of a broad education, is consistent with the philosophy of the College of Education.

Opportunities are increasing steadily for selected students to participate as employees of co-operating school departments. Assisting in administrative as well as instructional functions, the student enjoys unique opportunity to acquire broad viewpoints and rich experience which will greatly enhance his confidence and effectiveness as a teacher.

National Teacher Examinations

All students who plan to make teaching their career will be expected to take the general and special National Teacher Examinations in their senior year.

Programs of Instruction

Students in the College of Education will find a variety of fields of specialization available. For secondary teaching, there are Biology, Chemistry, Physics, General Science, Mathematics, Social Studies, English, and Foreign Languages. Those interested in elementary teaching must complete a broader type of major, in Social Science, Humanities, or Science and Mathematics. Those wishing Science and Mathematics will follow a program adapted from the General Science program. In addition to these, the special field of Physical Education is available. Specimen programs are shown on the pages that follow.

ELEMENTARY EDUCATION

FIRST YEAR

No.	TERM 1 Course	Cl.	Cr.	No.	TERM 2 Course	Cl.	Cr.	No.	TERM 3 Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
23.01	West. Civ.	4	4	23.02	West. Civ.	4	4	23.03	West. Civ.	4	4
22.41	Intro. to Pol. Sci.	3	3	22.42	Intro. to Pol. Sci.	3	3	22.43	Intro. to Pol. Sci.	3	3
17.01	Surv. Phys. Sci.	3	3	17.02	Surv. Phys. Sci.	3	3	17.03	Surv. Phys. Sci.	3	3
21.60	Soc. Sci.	3	3	21.61	Soc. Sci.	3	3	21.62	Soc. Sci.	3	3
16.10	Phys. Ed.			16.11	Phys. Ed.			16.12	Phys. Ed.		
	or				or				or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		16	**16**			**16**	**16**			**16**	**16**

SECOND YEAR

No.	TERM 4* Course	Cl.	Cr.	No.	TERM 5 Course	Cl.	Cr.	No.	TERM 6 Course	Cl.	Cr.
30.04	Intro. to Lit.	5	2½	17.11	Intro. Nat. Hist	4	4	17.12	Intro. Nat. Hist.	4	4
23.04	West. Civ.	4	2	20.06	Ec. Prin. & Prob.	4	4	20.07	Ec. Prin. & Prob.	4	4
17.04	Surv. Phys. Sci.	4	2	21.51	Human Dev.	3	3	21.52	Human Dev.	3	3
21.63	Soc. Sci.	4	2	23.17	U.S. to 1865	4	4	23.18	U.S. since 1863	4	4
					Elective	3	3	29.01	Pub. Speak.	3	3
		17	**8½**			**18**	**18**			**18**	**18**

THIRD YEAR

No.	TERM 7* Course	Cl.	Cr.	No.	TERM 8 Course	Cl.	Cr.	No.	TERM 9 Course	Cl.	Cr.
	Elective	8	4	21.41	Fund. Conc. Arith.	3	3	21.42	Fund. Conc. Arith.	3	3
	Elective	8	4	21.47	Fund. of Read.	3	3	21.48	Fund. of Read.	3	3
				21.53	Learning	3	3	21.54	Learn. & Eval.	3	3
				29.02	Pub. Speak.	3	3		Elective (Art or Music)	4	4
					Elective	4	4		Elective	4	4
		16	**8**			**16**	**16**			**17**	**17**

FOURTH YEAR

No.	TERM 10* Course	Cl.	Cr.	No.	TERM 11 Course	Cl.	Cr.	No.	TERM 12 Course	Cl.	Cr.
	Elective	8	4	21.50	Special Ed.	3	3	21.68	El. Curric. Lab.	(3)	3
	Elective	8	4	21.67	El. Curric. Lab.	(3)	3	30.36	Am. Lit. after 1860	4	4
				27.32	Creative Draw.	4	4		Elective	4	4
				30.35	Am. Lit. to 1860	4	4		Elective	4	4
					Elective	4	4				
		16	**8**			**15(3)**	**18**			**12(3)**	**15**

FIFTH YEAR

No.	TERM 14 Course	Cl.	Cr.	No.	TERM 15 Course	Cl.	Cr.
21.55	Backgrnd. Am. Ed.	3	3	21.56	Backgrnd. Am. Ed.	3	3
30.33	Surv. Eng. Lit.	4	4	30.34	Surv. Eng. Lit.	4	4
	Elective	4	4		Elective	4	4
	Elective	4	4		Elective	4	4
		15	**15**			**15**	**15**

Terms 14A and 15A (2 terms)**
21.40 Student Teaching and
Related Seminar   14 Credits

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*Summer term—5 weeks.   ( ) indicate laboratory hours.
**21.40 Student Teaching (14 credits) is required during both co-operative work periods of the senior year

TEACHING OF ENGLISH

FIRST YEAR

	TERM 1	Cl.	Cr.		TERM 2	Cl.	Cr.		TERM 3	Cl.	Cr.
No.	Course			No.	Course			No.	Course		
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
23.01	West. Civ.	4	4	23.02	West. Civ.	4	4	23.03	West. Civ	4	4
22.41	Intro. to			22.42	Intro. to			22.43	Intro. to		
	Pol. Sci.	3	3		Pol. Sci.	3	3		Pol. Sci.	3	3
17.01	Surv. Phys. Sci.	3	3	17.02	Surv. Phys. Sci.	3	3	17.03	Surv. Phys. Sci.	3	3
16.10	Soc. Sci.	3	3	21.61	Soc. Sci.	3	3	21.62	Soc. Sci.	3	3
16.10	Phys. Ed.			16.11	Phys. Ed.			16.12	Phys. Ed.		
	or				or				or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		16	**16**			**16**	**16**			**16**	**16**

SECOND YEAR

	TERM 4*	Cl.	Cr.		TERM 5	Cl.	Cr.		TERM 6	Cl.	Cr.
30.04	Intro. to Lit.	5	2½	20.06	Ec. Prin. &			20.07	Ec. Prin. &		
23.04	West. Civ.	4	2		Prob.	4	4		Prob.	4	4
17.04	Surv. Phys.			23.17	U.S. Hist.	4	4	23.18	U.S. Hist.	4	4
	Sci.	4	2	30.33	Eng. Lit.	4	4	30.34	Eng. Lit.	4	4
21.63	Soc. Sci.	4	2	21.51	Human Dev.	3	3	21.52	Human Dev.	3	3
								29.01	Pub. Speak.	3	3
		17	**8½**			**15**	**15**			**18**	**18**

THIRD YEAR

	TERM 7*	Cl.	Cr.		TERM 8	Cl.	Cr.		TERM 9	Cl.	Cr.
	Art Elect.	8	4	30.21	Inter. Writing	4	4	30.22	Inter. Writing	4	4
	Semantics	8	4	30.35	Am. Lit.	4	4	30.36	Am. Lit.	4	4
				24.01	Intro. to Phil.	4	4	24.02	Prob. of Phil.	4	4
				21.53	Learning	3	3	21.54	Learn. & Eval.	3	3
				29.02	Pub. Speak.	3	3				
		16	**8**			**18**	**18**			**15**	**15**

FOURTH YEAR

	TERM 10*	Cl.	Cr.		TERM 11	Cl.	Cr.		TERM 12	Cl.	Cr.
	Music Elect.	8	4	30.61	Shakespeare	4	4	30.62	Shakespeare	4	4
	Elective	8	4	23.13	Eng. Hist.	4	4	23.14	Eng. Hist.	4	4
				21.20	Meth. & Mat.			21.21	Meth. & Mat.		
					Eng.	3	3		Eng.	3	3
				30.29	Found. of Eng.	4	4	30.30	Found. of Eng.	4	4
		16	**8**			**15**	**15**			**15**	**15**

FIFTH YEAR

	TERM 14	Cl.	Cr.		TERM 15	Cl.	Cr.
21.55	Backgrnd. Am.			21.56	Backgrnd. Am.		
	Ed.	3	3		Ed.	3	3
	Eng. Elect.	4	4		Eng. Elect.	4	4
	Elective	4	4		Elective	4	4
	Elective	4	4		Elective	4	4
		15	**15**			**15**	**15**

Terms 14A and 15A (2 terms)**
21.40 Student Teaching and
Related Seminar   14 Credits

*Summer term—5 weeks.   ( ) indicate laboratory hours.
**21.40 Student Teaching (14 credits) is required during both co-operative work periods of the senior year.

TEACHING OF GENERAL SCIENCE

FIRST YEAR

TERM 1

No.	Course	Cl.	Cr.
10.01	Gen. Biol.	2(3)	3
30.01	English	3	3
11.01	Gen. Chem.	3(3)	4
14.21	Basic Math.	3	3
	or		
14.61	Math. Anal.	5	5
21.60	Soc. Sci.	3	3
16.10	Phys. Ed.		
	or		
61.01	ROTC (Basic)		
		14(6) 16	
		or	
		16(6) 18	

TERM 2

No.	Course	Cl.	Cr.
10.02	Gen. Biol.	2(3)	3
30.02	English	3	3
11.02	Gen. Chem.	3(3)	4
14.22	Basic Math.	3	3
	or		
14.62	Math. Anal.	5	5
21.61	Soc. Sci.	3	3
16.11	Phys. Ed.		
	or		
61.02	ROTC (Basic)		
		14(6) 16	
		or	
		16(6) 18	

TERM 3

No.	Course	Cl.	Cr.
10.03	Gen. Biol.	2(3)	3
30.03	English	3	3
11.03	Gen. Chem.	3(3)	4
14.23	Basic Math.	3	3
	or		
14.63	Math. Anal.	5	5
21.62	Soc. Sci.	3	3
16.12	Phys. Ed.		
	or		
61.03	ROTC (Basic)		
		14(6) 16	
		or	
		16(6) 18	

SECOND YEAR

TERM 4*

No.	Course	Cl.	Cr.
10.04	Gen. Biol.	3(3)	2
11.04	Gen. Chem.	3(3)	2
30.04	Intro. to Lit.	5	2½
21.63	Soc. Sci.	4	2
		15(6) 8½	

TERM 5

No.	Course	Cl.	Cr.
14.46	Math. Prin.	4	4
	or		
14.65	Math. Anal.	4	4
10.55	Comp. Vert.	3(3)	4
11.26	Org. Chem.	3(3)	4
21.51	Human Dev.	3	3
		13(6) 15	

TERM 6

No.	Course	Cl.	Cr.
14.47	Math. Prin.	4	4
	or		
14.66	Math. Anal.	4	4
10.56	Comp. Vert.	3(3)	4
11.27	Org. Chem.	3(3)	4
21.52	Human Dev.	3	3
29.01	Pub. Speak.	3	3
		16(6) 18	

THIRD YEAR

TERM 7*

No.	Course	Cl.	Cr.
	Electives		4
17.21	Obs. Astron.	5	2½

TERM 8

No.	Course	Cl.	Cr.
15.11	Gen. Phys.	4	4
10.40	Physiology	3(3)	4
23.17	U.S. Hist.	4	4
21.53	Learning	3	3
29.02	Pub. Speak.	3	3
		17(3) 18	

TERM 9

No.	Course	Cl.	Cr.
15.12	Gen. Phys.	3(3)	5
10.41	Physiology	3(3)	4
23.18	U.S. Hist.	4	4
21.54	Learn. & Eval.	3	3
		13(6) 16	

FOURTH YEAR

TERM 10*

Course	Cl.	Cr.
Electives		8

TERM 11

No.	Course	Cl.	Cr.
10.20	Gen. Bact.	3(3)	4
30.35	Am. Lit.	4	4
21.22	Meth. & Mat. Sci.	3	3
13.11	Prin. Geol.	4	4
		14(3) 15	

TERM 12

No.	Course	Cl.	Cr.
10.21	Gen. Bact.	3(3)	4
30.36	Am. Lit.	4	4
21.23	Meth. & Mat. Sci.	3	3
13.12	Hist. Geol.	4	4
		14(3) 15	

FIFTH YEAR

TERM 14

No.	Course	Cl.	Cr.
21.55	Backgrnd. Am. Ed.	3	3
	Sci. Elect.		4
	Electives		9
			16

TERM 15

No.	Course	Cl.	Cr.
21.56	Backgrnd. Am. Ed.	3	3
	Sci. Elect.		4
	Electives		9
			16

Terms 14A and 15A (2 terms)**
21.40 Student Teaching and
Related Seminar 14 Credits

*Summer term—5 weeks.   ( ) indicate laboratory hours.

**21.40 Student Teaching (14 credits) is required during both co-operative work periods of the senior year.

TEACHING OF MATHEMATICS

FIRST YEAR

TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
11.01	Gen. Chem.	3(3)	4	11.02	Gen. Chem.	3(3)	4	11.03	Gen. Chem.	3(3)	4
14.61	Math. Anal.	5	5	14.62	Math. Anal.	5	5	14.63	Math. Anal.	5	5
15.51	Physics	3	3	15.52	Physics	3	3	15.53	Physics	3	3
16.10	Soc. Sci.	3	3	21.61	Soc. Sci.	3	3	21.62	Soc. Sci.	3	3
16.10	Phys. Ed.			16.11	Phys. Ed.			16.12	Phys. Ed.		
	or				or				or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		17(3)	**18**			**17(3)**	**18**			**17(3)**	**18**

SECOND YEAR

TERM 4*				TERM 5				TERM 6		
11.04	Gen. Chem.	3(3)	2	14.65	Math. Anal.	4	4	14.66	Math. Anal.	4	4
14.64	Math. Anal.	5	2½	15.55	Physics	4(3)	5	15.56	Physics	3(3)	4
15.54	Physics	5	2½	21.51	Human Dev.	3	3	21.52	Human Dev.	3	3
21.60	Soc. Sci.	4	2		Elective	4	4	29.01	Pub. Speak.	3	3
									Elective	3	3
		17(3)	**9**			**15(3)**	**16**			**16(3)**	**17**

THIRD YEAR

TERM 7*				TERM 8				TERM 9		
21.57	SMSG Math.	5	2½	14.07	Diff. Equa.	4	4	14.08	Diff. Equa.	4	4
14.11	Theory of			14.31	Geometries	4	4	14.17	Inf. Series	4	4
	Equa.	5	2½	21.53	Learning	3	3		or		
	or			23.17	U.S. History	4	4		Elective		
14.60	Number			29.02	Pub. Speak.	3	3	21.54	Learn. & Eval.	3	3
	Theory	5	2½					23.18	U.S. History	4	4
14.14	Hist. of Math.	5	2½								
		15	**7½**			**18**	**18**			**15**	**15**

FOURTH YEAR

TERM 10*				TERM 11				TERM 12		
21.58	UICSM Math.	5	2½	14.15	Adv. Calc.	4	4	14.16	Adv. Calc.	4	4
14.13	Computer			14.33	Vector Anal.	4	4		or		
	Prog.	5	2½		or				Elective	4	4
14.39	Topics in Set				Elective	4	4	14.35	Num. Anal.	4	4
	Theory	5	2½	21.23	Meth. & Mat.			21.24	Meth. & Mat.		
					Math.	3	3		Math.	3	3
				30.35	Am. Lit.	4	4	30.36	Am. Lit.	4	4
					Elective	3	3		Elective	3	3
		15	**7½**			**18**	**18**			**18**	**18**

FIFTH YEAR

TERM 14				TERM 15		
14.37	Abs. Alg.	4	4	14.38	Abs. Alg.	4	4
14.28	Math. Stat.	4	4	14.29	Math. Stat.	4	4
21.55	Backgrnd. Am.			21.56	Backgrnd. Am.		
	Ed.	3	3		Ed.	3	3
	Elective	4	4		Elective	4	4
		15	**15**			**15**	**15**

Terms 14A and 15A (2 terms)**
21.40 Student Teaching and
         Related Seminar   14 Credits

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*Summer term—5 weeks.   ( ) indicate laboratory hours.
**21.40 Student Teaching (14 credits) is required during both co-operative work periods of the senior year.

TEACHING OF MODERN LANGUAGES

FIRST YEAR

No.	TERM 1 Course	Cl.	Cr.
30.01	English	3	3
23.01	West. Civ.	4	4
17.01	Surv. Phys. Sci.	3	3
21.60	Soc. Sci.	3	3
	Mod. Lang. Elect.	3	3
16.10	Phys. Ed. or		
61.01	ROTC (Basic)		
		16	**16**

No.	TERM 2 Course	Cl.	Cr.
30.02	English	3	3
23.02	West. Civ.	4	4
17.02	Surv. Phys. Sci.	3	3
21.61	Soc. Sci.	3	3
	Mod. Lang. Elect.	3	3
16.11	Phys. Ed. or		
61.02	ROTC (Basic)		
		16	**16**

No.	TERM 3 Course	Cl.	Cr.
30.03	English	3	3
23.03	West. Civ.	4	4
17.03	Surv. Phys. Sci.	3	3
21.62	Soc. Sci.	3	3
	Mod. Lang. Elect.	3	3
16.12	Phys. Ed. or		
61.03	ROTC (Basic)		
		16	**16**

SECOND YEAR

No.	TERM 4* Course	Cl.	Cr.
17.04	Surv. Phys. Sci.	4	2
21.63	Soc. Sci.	4	2
23.04	West. Civ.	4	2
30.04	Intro. to Lit.	5	2½
	Mod. Lang. Elect.	3	1½
		20	**10**

No.	TERM 5 Course	Cl.	Cr.
20.06	Ec. Prin. & Prob.	4	4
21.51	Human Dev.	3	3
23.17	U.S. to 1865	4	4
	Intermed. Lang.	4	4
		15	**15**

No.	TERM 6 Course	Cl.	Cr.
20.07	Ec. Prin. & Prob.	4	4
21.52	Human Dev.	3	3
23.18	U.S. since 1865	4	4
29.01	Pub. Speak.	3	3
	Intermed. Lang.	4	4
		18	**18**

THIRD YEAR

No.	TERM 7* Course	Cl.	Cr.
	Elective	8	4
	Elective	8	4
		16	**8**

No.	TERM 8 Course	Cl.	Cr.
21.53	Learning	3	3
29.01	Pub. Speak.	3	3
	Adv. Lang.	4	4
	Adv. Lang.	4	4
	Elective	4	4
		18	**18**

No.	TERM 9 Course	Cl.	Cr.
21.54	Learn. & Eval.	3	3
	Adv. Lang.	4	4
	Adv. Lang.	4	4
	Elective	4	4
		15	**15**

FOURTH YEAR

No.	TERM 10* Course	Cl.	Cr.
	Elective	8	4
	Elective	8	4
		16	**8**

No.	TERM 11 Course	Cl.	Cr.
21.43	Meth. & Mat.— Mod. Lang.	3	3
30.33	Eng. Lit.	4	4
	Adv. Lang.	4	4
	Adv. Lang.	4	4
		15	**15**

No.	TERM 12 Course	Cl.	Cr.
21.44	Meth. & Mat.— Mod. Lang.	3	3
30.34	Eng. Lit.	4	4
	Adv. Lang.	4	4
	Adv. Lang.	4	4
		15	**15**

FIFTH YEAR

No.	TERM 14 Course	Cl.	Cr.
21.55	Backgrnd. of Am. Ed.	3	3
	Adv. Lang.	4	4
	Adv. Lang.	4	4
	Elective	4	4
		15	**15**

No.	TERM 15 Course	Cl.	Cr.
21.56	Backgrnd. of Am. Ed.	3	3
	Adv. Lang.	4	4
	Adv. Lang.	4	4
	Elective	4	4
		15	**15**

Terms 14A and 15A (2 terms)**
21.40 Student Teaching and
Related Seminar   14 Credits

*Summer term—5 weeks.
**21.40 Student Teaching (14 credits) is required during both co-operative work periods of the senior year.

TEACHING OF PHYSICAL EDUCATION (MEN)

FIRST YEAR

No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
	TERM 1				**TERM 2**				**TERM 3**		
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
17.01	Surv. Phys. Sci.	3	3	17.02	Surv. Phys. Sci.	3	3	17.03	Surv. Phys. Sci.	3	3
23.01	West. Civ.	4	4	23.02	West. Civ.	4	4	23.03	West. Civ.	4	4
21.60	Soc. Sci.	3	3	21.61	Soc. Sci.	3	3	21.62	Soc. Sci.	3	3
10.01	Gen. Biol.	2(3)	3	10.02	Gen. Biol.	2(3)	3	10.03	Gen. Biol.	2(3)	3
16.71	Aquatics	1(3)	2	16.72	Aquatics	1(3)	2	16.63	Team Sports	1(3)	2
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		16(6)	**18**			**16(6)**	**18**			**16(6)**	**18**

SECOND YEAR

No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
	TERM 4*				**TERM 5**				**TERM 6**		
30.04	Intro. to Lit.	5	2½	21.51	Human Dev.	3	3	21.52	Human Dev.	3	3
21.63	Soc. Sci.	4	2	29.01	Pub. Speak.	3	3		Elective***	3	3
16.20	Intro. to P.E.	4	2	21.41	Fund. Conc. Arith.	3	3	21.42	Fund. Conc. Arith.	3	3
16.18	Indiv. Sports	2(6)	2		or				or		
				14.44	Math. Prin.	4	4	14.45	Math. Prin.	4	4
				16.13	Anat. & Physiol.	5	5	16.14	Anat. & Physiol.	5	5
				16.64	Gymnastics	1(3)	2	16.65	Gymnastics	1(3)	2
		15(6)	**8½**			**15(3)**	**16**			**15(3)**	**16**
						or				**or**	
						16(3)	**17**			**16(3)**	**17**

THIRD YEAR

No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
	TERM 7*				**TERM 8**				**TERM 9**		
16.33	First Aid and Safety	4	2	21.53	Learning	3	3	21.54	Learn. & Eval.	3	3
16.19	Indiv. Sports	2(6)	2	16.43	Athl. Train.	4	4	16.21	Prin. of P.E.	4	4
	Elective	8	4	16.31	Kinesiology	4	4	16.32	Phys. of Exer.	4	4
				16.61	Ftball & Track	2(2)	3	16.62	Bskt. & Base.	2(2)	3
				16.34	Pers. Health	4	4	16.35	School & Commun. Hlth.	4	4
		14(6)	**8**			**17(2)**	**18**			**17(2)**	**18**

FOURTH YEAR

No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
	TERM 10*				**TERM 11**				**TERM 12**		
16.51	Camp Ldrship	2(6)	2		Elective	4	4		P.E. Elect.****	4	4
	Elective	4	2	21.29	Meth. & Mat.—P.E.	3	3	21.30	Meth. & Mat.—P.E.	3	3
	Elective	8	4	16.41	Meas. Eval.—P.E.	4	4	16.42	P.E. for Atyp.	4	4
				16.66	Intro. to Wt. Trng. & Combat	1(3)	2	16.81	Elem. School Games	1(3)	2
				23.17	U.S. to 1865	4	4	23.18	U.S. since 1865	4	4
		14(6)	**8**			**16(3)**	**17**			**16(3)**	**17**

FIFTH YEAR

No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
	TERM 14				**TERM 15**		
21.55	Backgrnd. of Am. Ed.	3	3	21.56	Backgrnd. of Am. Ed.	3	3
30.35	Am. Lit.	4	4	30.36	Am. Lit.	4	4
16.24	Org. & Adm.—P.E.	4	4	16.52	Intro. to Rec.	4	4
16.82	Dance I	1(3)	2	16.83	Dance II	1(3)	2
	Elective	4	4		Elective	4	4
		16(3)	**17**			**16(3)**	**17**

Terms 14A and 15A (2 terms)**
21.40 Student Teaching and Related Seminar   14 Credits

*Summer term—5 weeks.   ( ) indicate laboratory hours.
**21.40 Student Teaching (14 credits) is required during both co-operative work periods of the senior year.
***Elective for those successfully completing 29.01.
****Choice of 16.25 and 16.26 odd years, 16.27 and 16.28 even years.

TEACHING OF PHYSICAL EDUCATION (WOMEN)

FIRST YEAR

	TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
17.01	Surv. Phys. Sci.	3	3	17.02	Surv. Phys. Sci.	3	3	17.03	Surv. Phys. Sci.	3	3
23.01	West. Civ.	4	4	23.02	West. Civ.	4	4	23.03	West. Civ.	4	4
21.60	Soc. Sci.	3	3	21.61	Soc. Sci.	3	3	21.62	Soc. Sci.	3	3
10.01	Gen. Biol.	2(3)	3	10.02	Gen. Biol.	2(3)	3	10.03	Gen. Biol.	2(3)	3
16.84	Mod. Dance	1(3)	2	16.85	Mod. Dance	1(3)	2	16.63	Team Sports	1(3)	2
		16(6)	**18**			**16(6)**	**18**			**16(6)**	**18**

This five-year, co-operative program is being initiated in September, 1964. Only first-year courses will be given during 1964-65.

BOSTON-BOUVÉ COLLEGE OF
PHYSICAL EDUCATION AND PHYSICAL THERAPY

The Bouvé-Boston School, formerly affiliated with Tufts University, merged with Northeastern as of July 1, 1964, and became the Boston-Bouvé College of Physical Education and Physical Therapy of Northeastern University, a coeducational college on the Co-operative Plan. Classes already enrolled at Bouvé-Boston School will be carried through their present programs and will be housed on the Tufts Campus through 1965-66. Bouvé-Boston freshmen admitted to the four-year program in the fall of 1964 will also be located on the Tufts Campus for the first two years of their curricula and will then finish their programs at Northeastern. All students admitted to existing four-year curricula at Bouvé-Boston School will be given an opportunity to complete their programs of study.

In 1964-65, two freshman classes in physical education for women will be admitted: one to five-year, co-operative curricula on the Northeastern Campus (see above), and the other to four-year programs on the Tufts Campus. Beginning in 1965-66, all freshmen in physical education — both men and women — will be enrolled in five-year, co-operative curricula on the Northeastern Campus.

TEACHING OF SCIENCE

FIRST YEAR

	TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
11.01	Gen. Chem.	3(3)	4	11.02	Gen. Chem.	3(3)	4	11.03	Gen. Chem.	3(3)	4
14.61	Math. Anal.	5	5	14.62	Math. Anal.	5	5	14.63	Math. Anal.	5	5
15.51	Physics	3	3	15.52	Physics	3	3	15.53	Physics	3	3
16.10	Phys. Ed.	3	3	21.61	Soc. Sci.	3	3	21.62	Soc. Sci.	3	3
	or			16.11	Phys. Ed.			16.12	Phys. Ed.		
61.01	ROTC (Basic)				or				or		
				61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		17(3)	18			17(3)	18			17(3)	18

SECOND YEAR

	TERM 4*				TERM 5				TERM 6		
11.04	Gen. Chem.	3(3)	2	21.51	Human. Dev.	3	3	21.52	Human. Dev.	3	3
14.64	Math. Anal.	5	2½	14.65	Math. Anal.	4	4	14.66	Math. Anal.	4	4
15.54	Physics	5	2½	15.55	Physics	4(3)	5	15.56	Physics	3(3)	4
21.60	Soc. Sci.	4	2		Elective	4	4		Elective	4	4
								29.01	Pub. Speak.	3	3
		17(3)	9			15(3)	16			17(3)	18

THIRD YEAR

	TERM 7*				TERM 8				TERM 9		
	Elective	8	4	14.07	Diff. Equa.	4	4	14.08	Diff. Equa.	4	4
	Elective	8	4	21.53	Learning	3	3	21.54	Learn. & Eval.	3	3
					Sci. Elect.	4	4		Sci. Elect.	4	4
					Elective	4	4		Elective	4	4
		16	8			15	15			15	15

FOURTH YEAR

	TERM 10*				TERM 11				TERM 12		
	Elective	8	4	21.22	Meth. & Mat. Sci.	2	2	21.46	Meth. & Mat. Sci.	2	2
	Elective	8	4	30.35	Am. Lit. to 1860	4	4	30.36	Am. Lit. after 1860	4	4
				23.17	U.S. to 1865	4	4	23.18	U.S. since 1865	4	4
					Sci. Elect.	4	4		Sci. Elect.	4	4
					Elective	4	4		Elective	4	4
		16	8			18	18			18	18

FIFTH YEAR

	TERM 14				TERM 15		
21.55	Backgrnd. of Am. Ed.	3	3	21.56	Backgrnd. of Am. Ed.	3	3
	Sci. Elect.	4	4		Sci. Elect.	4	4
	Elective	4	4		Elective	4	4
	Elective	4	4		Elective	4	4
		15	15			15	15

Terms 14A and 15A (2 terms)**
21.40 Student Teaching and Related Seminar   14 Credits

*Summer term—5 weeks.   ( ) indicate laboratory hours.
**21.40 Student Teaching (14 credits) is required during both co-operative work periods of the senior year.

TEACHING OF SOCIAL STUDIES

FIRST YEAR

	TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
23.01	West. Civ.	4	4	23.02	West. Civ.	4	4	23.03	West. Civ.	4	4
22.41	Intro. to			22.42	Intro. to			22.43	Intro. to		
	Pol. Sci.	3	3		Pol. Sci.	3	3		Pol. Sci.	3	3
17.01	Surv. Phys. Sci.	3	3	17.02	Surv. Phys. Sci.	3	3	17.03	Surv. Phys. Sci.	3	3
21.60	Soc. Sci.	3	3	21.61	Soc. Sci.	3	3	21.62	Soc. Sci.	3	3
16.10	Phys. Ed.			16.11	Phys. Ed.			16.12	Phys. Ed.		
	or				or				or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		16	**16**			**16**	**16**			**16**	**16**

SECOND YEAR

	TERM 4*				TERM 5				TERM 6		
30.04	Intro. to Lit.	5	2½	30.33	Eng. Lit.	4	4	30.34	Eng. Lit.	4	4
23.04	West. Civ.	4	2	23.17	U.S. Hist.	4	4	23.18	U.S. Hist.	4	4
17.04	Surv. Phys.			20.06	Ec. Prin. &			20.07	Ec. Prin. &		
	Sci.	4	2		Prob.	4	4		Prob.	4	4
21.63	Soc. Sci.	4	2	21.51	Human Dev.	3	3	21.52	Human Dev.	3	3
					Elective	3	3	29.01	Pub. Speak.	3	3
		17	**8½**			**18**	**18**			**18**	**18**

THIRD YEAR

	TERM 7*				TERM 8				TERM 9		
	Art Elect.	8	4	23.25	East. Civ.	4	4	23.26	East. Civ.	4	4
	Geog. Elect.	8	4		or				or		
					Hist. Elect.				Hist. Elect.		
				30.35	Am. Lit.	4	4	30.36	Am. Lit.	4	4
				21.53	Learning	3	3	21.54	Learn. & Eval.	3	3
				29.02	Pub. Speak.	3	3		Hist. Elect.	4	4
					Elective	4	4				
		16	**8**			**18**	**18**			**15**	**15**

FOURTH YEAR

	TERM 10*				TERM 11				TERM 12		
	Music Elect.	8	4	22.11	For. Govt.	4	4	22.12	For. Govt.	4	4
	Geog. Elect.	8	4	23.24	Russia	4	4	23.07	Sov. Russia	4	4
				21.25	Meth. & Mat.			21.26	Meth. & Mat.		
					Soc. Stud.	3	3		Soc. Stud.	3	3
					Hist. or Govt.				Hist. or Govt.		
					Elect.	4	4		Elect.	4	4
		16	**8**			**15**	**15**			**15**	**15**

FIFTH YEAR

	TERM 14				TERM 15		
22.17	Internatl. Rel.	4	4	22.18	Internatl. Org.	4	4
22.13	Pol. Theory	4	4		Hist. Elec.	4	4
	Hist. Elect.	4	4	22.14	Pol. Theory	4	4
21.55	Backgrnd. Am.			21.56	Backgrnd. Am.		
	Ed.	3	3		Ed.	3	3
	Elective	3	3		Elective	3	3
		18	**18**			**18**	**18**

Terms 14A and 15A (2 terms)**
21.40 Student Teaching and
Related Seminar   14 Credits

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*Summer term—5 weeks.   ( ) indicate laboratory hours.
**21.40 Student Teaching (14 credits) is required during both co-operative work periods of the senior year.

College of Liberal Arts

Dr. Wilfred S. Lake, Dean

Aims

The College of Liberal Arts seeks to guide young men and women toward intellectual maturity. The mature person is aware of the significant phenomena of the world and has the ability to cope with them effectively and creatively.

To help the student understand the conditions of man's existence, the College of Liberal Arts requires him to study ideas and experiences that are the subject matter of a variety of disciplines. To prepare him to play an effective role in the world, a departmental curriculum helps him to master the concepts and methods of a specific discipline. Detailed study of a field is essential to liberal education, for only through specialization can a student acquire insight into the intellectual processes which form the basis of all knowledge. Broader study is equally necessary for effective action, for only through variety of inquiry can a student gain perspective about his rights and responsibilities as an individual and about the importance and limitations of his specialty.

Northeastern University's Co-operative Plan contributes to a liberal education by providing valuable opportunities for the student to test and extend his understanding of the complex world and of his special field through direct experience and practical application.

At best, however, the brevity of his own undergraduate experience and the vastness of human experience permit the student only to start, not to complete, his education. Moreover, education is an unending process because man's understanding of the world continually changes and grows. Consequently, the most enduring contribution a college of liberal arts can make is to help the individual acquire the skill and motivation to continue his intellectual development throughout his life.

Methods

To enable each student to plan a college program in keeping with his own interests and aptitudes, a wide range of electives is offered. This does not mean that students are free to elect courses indiscriminately, for if they are to obtain a liberal education they must have training in several basic fields. Therefore, a definite series of basic courses in each curriculum is required by the faculty. These required courses are largely concentrated in the first two years of the curriculum.

Through a comprehensive guidance program students are directed in their selection of courses so that they obtain the proper preparation for their intended vocations. Specialization in a major field is emphasized during the latter part of the curriculum and is facilitated by the opportunity for electing certain courses in the other Basic Colleges of the University.

Through the Northeastern plan of co-operative education for upperclassmen, the student makes early contact with actual working conditions and profits by the wholesome experience of earning at least part of the money to defray col-

lege expenses. Viewed as a whole, then, the college years surround the student not with an artificial atmosphere of cloistered scholarship but with an environment very close to that which he or she will enter after graduation, and thus tend to make for more ready employment, an essential element of vocational competence. The curricula in the College of Liberal Arts afford not only a broad cultural training but also the necessary foundation for a wide range of vocations for both young men and young women.

Admission Requirements

The College of Liberal Arts offers three broad areas of study. Since the freshman-year program is different in each of these areas, entrance requirements also vary.

All curricula:

Subject	Units
English (4 years)	3
Foreign language (at least 2 years)	2
Mathematics (at least 1 year)	1
Science (at least 1 year)	1
Other college preparatory subjects	4
Electives, not more than	4
	15

The following curricula must include these mathematics and science units:

Biological science curricula (including Premedical, Predental, Medical Technology, and Biology)

Algebra, through quadratics, and Plane Geometry	3 units
Biology and Chemistry	2 units

Science curricula (Physics, Chemistry, Mathematics)

Algebra, through quadratics; Plane Geometry and Trigonometry	3½ units
Physics and Chemistry	2 units

Students who wish to major in Psychology must be able to demonstrate strength in the fields of mathematics and the sciences.

GRADUATION REQUIREMENTS

Degrees

The College of Liberal Arts awards the Bachelor of Arts degree to qualified candidates who have completed any one of the curricula offered.

Quantitative Requirements

Candidates for a degree must have completed one of the curricula listed on pages 92-103 and in their required and elective courses must complete at least 18 credit hours of work in each of the following areas:

I. Science and Mathematics	Biology, Chemistry, Geology, Mathematics, Natural Science, Physics, or Psychology (laboratory courses).
II. Humanities	Art, Drama, Literature and Languages (excluding freshman English and elementary language), Philosophy, or Speech.
III. Social Sciences	Economics, History, Political Science, Psychology, or Sociology-Anthropology.

All candidates for a degree must have satisfactorily completed in college one year of a modern foreign language above the elementary level.

Students who undertake co-operative work assignments must meet the requirements of the Department of Co-operative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until at least one year of academic work immediately preceding graduation has been completed at Northeastern.

Qualitative Requirements

An average grade of C is required for graduation.

Graduation with Honor

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least three years before they may become eligible for honors at graduation.

Curricular Requirements

The required courses in each curriculum are indicated on the following pages. Upon petition to the faculty, substitutions may be permitted in exceptional cases when required by the specific vocational objective of the student.

During the last year students in all curricula are required to take 50-20 Placement Techniques, designed to prepare them for placement in specific positions in their chosen vocational field. Under expert guidance each student prepares a complete personnel record, studies himself or herself and the opportunities that are open, and works out a complete campaign for obtaining after-graduation employment. Qualified students planning to go to graduate school may be excused upon petition to the faculty.

Combined Program with Professional Schools

Students who have completed at least three quarters of the work required for the baccalaureate degree at Northeastern University before entering an approved professional school of dentistry, law, or medicine, will be granted the Bachelor of Arts degree upon receipt of the professional degree, provided at least two thirds of the work for the baccalaureate degree has been earned in residence at Northeastern and all other graduation requirements have been fulfilled. The residence requirement at Northeastern University must have been completed immediately prior to entrance into the professional school. Under this plan preprofessional students may reduce by one year the time ordinarily required for obtaining both degrees.

Four-Year Plan

All curricula in the College of Liberal Arts are normally organized on the five-year Co-operative Plan, which is the distinctive feature of Northeastern University.

However, in all majors except Chemistry and Physics, qualified students may be excused from the Co-operative Plan by the Dean and may complete the requirements for the degree in four years.

Honors Program

An honors program is provided in the College of Liberal Arts to enable superior students to develop their potential to the highest degree by making it possible for them to pursue studies in their major fields to greater depth than is possible in the regular courses.

The nature of the program will be determined by the academic department concerned. Programs may involve any of the following elements: special research projects culminating in honor theses, honor seminars, reading projects, directed independent study, or creative work. Flexibility is the keynote, with every consideration being given to the individual needs and requirements of the student.

The program will be open to junior and senior students approved by the Faculty Honors Committee. To be eligible a student must have a grade-point average of 3.0 with no grade below B in all courses in the major field after the freshman year. The latter requirement may be waived by the Honors Committee on recommendation of the Department Chairman in exceptional cases.

BIOLOGY

FIRST YEAR

	TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
11.01	Gen. Chem.	3(3)	4	11.02	Gen. Chem.	3(3)	4	11.03	Gen. Chem.	3(3)	4
14.21	Basic Math.	3	3	14.22	Basic Math.	3	3	14.23	Basic Math.	3	3
10.01	Gen. Biol.	2(3)	3	10.02	Gen. Biol.	2(3)	3	10.03	Gen. Biol.	2(3)	3
	Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3
16.10	Phys. Ed.			16.11	Phys. Ed.			16.12	Phys. Ed.		
	or				or				or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		14(6)	**16**			**14(6)**	**16**			**14(6)**	**16**

SECOND YEAR

	TERM 4*				TERM 5				TERM 6		
10.04	Gen. Biol.	3(3)	2	10.55	Comp. Anat.	3(3)	4	10.56	Comp. Anat.	3(3)	4
11.04	Gen. Chem.	3(3)	2	11.26	Org. Chem.	3(3)	4	11.27	Org. Chem.	3(3)	4
30.04	Intro. to Lit.	5	2½	20.06	Ec. Prin. & Prob.	4	4	20.07	Ec. Prin. & Prob.	4	4
	Mod. Lang. Elect.	3	1½		Mod. Lang. Elect.	4	4		Mod. Lang. Elect.	4	4
		14(6)	**8**			**14(6)**	**16**			**14(6)**	**16**

THIRD YEAR

	TERM 7*				TERM 8				TERM 9		
	Elective	5	2½	10.57	Invert. Zool.	3(3)	4	10.58	Invert. Zool.	3(3)	4
	Elective	5	2½	11.28	Org. Chem.	4(3)	5	10.62	Embryology	3(3)	4
	Elective	5	2½	10.61	Embryology	3(3)	4	11.45	Biol. Chem.	4	4
					Elective	4	4		Elective	4	4
		15	**7½**			**14(9)**	**17**			**14(6)**	**16**

FOURTH YEAR

	TERM 10*				TERM 11				TERM 12		
	Elective	5	2½	15.11	Gen. Phys.	4	4	10.60	An. Histol.	3(3)	4
	Elective	5	2½	10.59	An. Histol.	3(3)	4	10.66	Genetics	3(3)	4
	Elective	5	2½	10.65	Genetics	3(3)	4	11.18	Quant. Anal.	2(3)	3
				11.17	Quant. Anal.	3(3)	4	15.12	Physics	3(3)	5
		15	**7½**			**13(9)**	**16**			**11(12)**	**16**

FIFTH YEAR

	TERM 13*				TERM 14				TERM 15		
	Elective	5	2½	10.63	Cell Phys.	3(3)	4	10.64	Cell Phys.	3(3)	4
	Elective	5	2½	10.69	Hist. Tech.	1(6)	3	10.70	Histol. Tech.	1(6)	3
	Elective	5	2½	15.13	Gen. Phys.	3(3)	5		Elective	4	4
				50.20	Place. Tech.	2	1		Elective	4	4
					Elective	4	4				
		15	**7½**			**13(12)**	**17**			**12(9)**	**15**

*Summer term—5 weeks.   ( ) indicate laboratory hours.

CHEMISTRY

FIRST YEAR

No.	TERM 1 Course	Cl.	Cr.	No.	TERM 2 Course	Cl.	Cr.	No.	TERM 3 Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
11.46	Gen. Chem.	3(3)	4	11.47	Gen. Chem.	3(3)	4	11.48	Gen. Chem.	3(6)	5
14.61	Math. Anal.	4	4	14.62	Math. Anal.	4	4	14.63	Math. Anal.	4	4
15.51	Physics	3	3	15.52	Physics	3	3	15.53	Physics	3	3
32.01	El. German	3	3	32.02	El. German	3	3	32.03	El. German	3	3
16.10	Phys. Ed. or			16.11	Phys. Ed. or			16.12	Phys. Ed. or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		16(3)	**17**			**16(3)**	**17**			**16(6)**	**18**

SECOND YEAR

No.	TERM 4* Course	Cl.	Cr.	No.	TERM 5 Course	Cl.	Cr.	No.	TERM 6 Course	Cl.	Cr.
11.49	Gen. Chem.	3(6)	2½	11.50	Org. Chem.	3(6)	5	11.52	Org. Chem.	3(6)	5
14.64	Math. Anal.	4	2	14.65	Math. Anal.	4	4	14.66	Math. Anal.	4	4
15.54	Physics	5	2½	15.55	Physics	4(3)	5	15.56	Physics	3(3)	4
32.04	El. German	3	1½	32.15	Inter. German	4	4	32.16	Inter. German	4	4
		15(6)	**8½**			**15(9)**	**18**			**14(9)**	**17**

THIRD YEAR

No.	TERM 7* Course	Cl.	Cr.	No.	TERM 8 Course	Cl.	Cr.	No.	TERM 9 Course	Cl.	Cr.
	Elective	5	2½	11.53	Org. Chem.	3(3)	4	11.62	Phys. Chem.	3(3)	4
	Elective	5	2½	11.61	Phys. Chem.	3(3)	4	15.63	Adv. Physics	0(3)	1
	Elective	5	2½	15.15	Adv. Physics	3(2)	4	20.12	Economics	3	3
				20.11	Economics	3	3		Elective or		
								11.45	Biochemistry	4	4
								11.55	Org. Chem.	3	3
		15	**7½**			**12(8)**	**15**			**13(6)**	**15**

FOURTH YEAR

No.	TERM 10* Course	Cl.	Cr.	No.	TERM 11 Course	Cl.	Cr.	No.	TERM 12 Course	Cl.	Cr.
11.70	Quant. Anal.	5(6)	3½	11.63	Phys. Chem.	3(3)	4	11.64	Phys. Chem.	3(3)	4
	Elective	5	2½	11.71	Quant. Anal.	3(6)	5	11.76	Inst. Anal.	3(6)	5
	Elective	5	2½	11.41	Chem. Lit.	3	3		Elective	4	4
					Elective or	4	4		Elective or	4	4
				14.07	Diff. Eq.			14.08	Diff. Eq.		
		15(6)	**8½**			**13(9)**	**16**			**14(9)**	**17**

FIFTH YEAR

No.	TERM 13* Course	Cl.	Cr.	No.	TERM 14 Course	Cl.	Cr.	No.	TERM 15 Course	Cl.	Cr.
	Elective	5	2½	11.91	Special Topics or	3	3	11.82	Inorg. Chem.	3	3
	Elective	5	2½	11.93	Nuclear Chem.	3	3	11.92	Special Topics or	3	3
	Elective	5	2½	11.57	Qual. Org. Anal.	0(9)	3	11.58	Org. Prep.	0(9)	3
				11.81	Inorg. Chem.	3	3	29.03	Eff. Speak.	3	3
				50.20	Place. Tech.	2	1		Elective	4	4
					Elective	4	4				
		15	**7½**			**12(9)**	**14**			**13**	**13**
										or **10(9)**	**13**

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*Summer term—5 weeks.   ( ) indicate laboratory hours.

ECONOMICS

FIRST YEAR

No.	Course (TERM 1)	Cl.	Cr.	No.	Course (TERM 2)	Cl.	Cr.	No.	Course (TERM 3)	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
23.01	West. Civ.	4	4	23.02	West. Civ.	4	4	23.03	West. Civ.	4	4
22.41	Intro. to Pol. Sci.	3	3	22.42	Intro. to Pol. Sci.	3	3	22.43	Intro. to Pol. Sci.	3	3
17.01	Surv. Phys. Sci.	3	3	17.02	Surv. Phys. Sci.	3	3	17.03	Surv. Phys. Sci.	3	3
	Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3
16.10	Phys. Ed. or			16.11	Phys. Ed. or			16.12	Phys. Ed. or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		16	**16**			**16**	**16**			**16**	**16**

SECOND YEAR

No.	Course (TERM 4*)	Cl.	Cr.	No.	Course (TERM 5)	Cl.	Cr.	No.	Course (TERM 6)	Cl.	Cr.
17.04	Surv. Phys. Sci.	4	2	20.06	Ec. Prin. & Prob.	4	4	20.07	Ec. Prin. & Prob.	4	4
23.04	West. Civ.	4	2	25.01a	Intro. Psych.	3(3)	4	25.02a	Gen. Psych.	3(3)	4
	Mod. Lang. Elect.	3	1½	36.01	Prin. Anthr.	4	4	36.02	Prin. Soc.	4	4
30.04	Intro. to Lit.	5	2½		Mod. Lang. Elect.	4	4		Mod. Lang. Elect.	4	4
		16	**8**			**15(3)**	**16**			**15(3)**	**16**

THIRD YEAR

Course (TERM 7*)	Cl.	Cr.	No.	Course (TERM 8)	Cl.	Cr.	No.	Course (TERM 9)	Cl.	Cr.
Elective	5	2½	14.44	Math. Prin.	4	4	14.45	Math. Prin.	4	4
Elective	5	2½	20.18	Am. Ec. Hist.	4	4	20.28	Ec. Systems	4	4
Elective	5	2½		Elective	4	4		Elective	4	4
				Elective	4	4		Elective	4	4
	15	**7½**			**16**	**16**			**16**	**16**

FOURTH YEAR

Course (TERM 10*)	Cl.	Cr.	No.	Course (TERM 11)	Cl.	Cr.	No.	Course (TERM 12)	Cl.	Cr.
Elective	5	2½	20.20	Statistics	3(2)	4	20.21	Statistics	4	4
Elective	5	2½	20.29	Inter. Ec.	4	4	20.30	Inter. Ec.	4	4
Elective	5	2½		Elective	4	4		Elective	4	4
				Elective	4	4		Elective	4	4
	15	**7½**			**15(2)**	**16**			**16**	**16**

FIFTH YEAR

Course (TERM 13*)	Cl.	Cr.	No.	Course (TERM 14)	Cl.	Cr.	No.	Course (TERM 15)	Cl.	Cr.
Elective	5	2½	20.24	Mon. & Bkg.	4	4	20.33	Hist. Ec. Thought	4	4
Elective	5	2½	20.31	Adv. Ec. Theory	4	4	20.32	Adv. Ec. Theory	4	4
Elective	5	2½		Elective	4	4		Elective	4	4
				Elective	4	4		Elective	4	4
			50.20	Place. Tech.	2	1				
	15	**7½**			**18**	**17**			**16**	**16**

*Summer term—5 weeks. ( ) indicate laboratory hours.

ENGLISH AND ENGLISH-JOURNALISM

FIRST YEAR

TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
23.01	West. Civ.	4	4	23.02	West. Civ.	4	4	23.03	West. Civ.	4	4
22.41	Intro. to			22.42	Intro. to			23.43	Intro. to		
	Pol. Sci.	3	3		Pol. Sci.	3	3		Pol. Sci.	3	3
17.01	Surv. Phys. Sci.	3	3	17.02	Surv. Phys. Sci.	3	3	17.03	Surv. Phys. Sci.	3	3
	Mod. Lang.				Mod. Lang.				Mod. Lang.		
	Elect.	3	3		Elect.	3	3		Elect.	3	3
16.10	Phys. Ed.			16.11	Phys. Ed.			16.12	Phys. Ed.		
	or				or				or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		16	**16**			**16**	**16**			**16**	**16**

SECOND YEAR

TERM 4*				TERM 5				TERM 6		
17.04	Surv. Phys.			20.06	Ec. Prin. &			20.07	Ec. Prin. &		
	Sci.	4	2		Prob.	4	4		Prob.	4	4
23.04	West. Civ.	4	2	23.17	U.S. to 1865	4	4	23.18	U.S. since 1865	4	4
	Mod. Lang.			30.33	Eng. Lit.	4	4	30.34	Eng. Lit.	4	4
	Elect.	3	1½		Mod. Lang.				Mod. Lang.		
30.04	Intro. to Lit.	5	2½		Elect.	4	4		Elect.	4	4
		16	**8**			**16**	**16**			**16**	**16**

THIRD YEAR

TERM 7*				TERM 8				TERM 9		
	Elective	5	2½	30.21	Inter. Writ.	4	4	30.22	Inter. Writ.	4	4
	Elective	5	2½	30.51	Intro. Jour.	4	4	30.52	Intro. Jour.	4	4
	Elective	5	2½		or				or		
					Eng. Elect.	4	4		Eng. Elect.	4	4
					Elective	4	4		Elective	4	4
					Elective	4	4		Elective	4	4
		15	**7½**			**16**	**16**			**16**	**16**

FOURTH YEAR

TERM 10*				TERM 11				TERM 12		
	Elective	5	2½	30.53	Tech. of Jour.	4	4	30.54	Tech. of Jour.	4	4
	Elective	5	2½		or				or		
	Elective	5	2½		Eng. Elect.	4	4		Eng. Elect.	4	4
					Eng. Elect.	4	4		Eng. Elect.	4	4
					Elective	4	4		Elective	4	4
					Elective	4	4		Elective	4	4
		15	**7½**			**16**	**16**			**16**	**16**

FIFTH YEAR

TERM 13*				TERM 14				TERM 15		
	Elective	5	2½		Eng. Elect.	4	4		Eng. Elect.	4	4
	Elective	5	2½		Eng. Elect.	4	4		Eng. Elect.	4	4
	Elective	5	2½		Elective	4	4		Elective	4	4
					Elective	4	4		Elective	4	4
				50.20	Place. Tech.	2	1				
		15	**7½**			**18**	**17**			**16**	**16**

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*Summer term—5 weeks.   ( ) indicate laboratory hours.

HISTORY

FIRST YEAR

No.	TERM 1 Course	Cl.	Cr.	No.	TERM 2 Course	Cl.	Cr.	No.	TERM 3 Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
23.01	West Civ.	4	4	23.02	West. Civ.	4	4	23.03	West. Civ.	4	4
22.41	Intro. to Pol. Sci.	3	3	22.42	Intro. to Pol. Sci.	3	3	22.43	Intro. to Pol. Sci.	3	3
17.01	Surv. Phys. Sci.	3	3	17.02	Surv. Phys. Sci.	3	3	17.03	Surv. Phys. Sci.	3	3
	Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3
16.10	Phys. Ed. or			16.11	Phys. Ed. or			16.12	Phys. Ed. or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		16	16			16	16			16	16

SECOND YEAR

No.	TERM 4* Course	Cl.	Cr.	No.	TERM 5 Course	Cl.	Cr.	No.	TERM 6 Course	Cl.	Cr.
17.04	Surv. Phys. Sci.	4	2	20.06	Ec. Prin. & Prob.	4	4	20.07	Ec. Prin. & Prob.	4	4
23.04	West. Civ.	4	2	23.17	U.S. to 1865	4	4	23.18	U.S. since 1865	4	4
	Mod. Lang. Elect.	3	1½	22.11	For. Govt.	4	4	22.12	For. Govt.	4	4
30.04	Intro. to Lit.	5	2½		Mod. Lang. Elect.	4	4		Mod. Lang. Elect.	4	4
		16	8			16	16			16	16

THIRD YEAR

TERM 7* Course	Cl.	Cr.	TERM 8 Course	Cl.	Cr.	TERM 9 Course	Cl.	Cr.
Elective	5	2½	Hist. Craft	4	4	Hist. Elect.	4	4
Elective	5	2½	Hist. Elect.	4	4	Hist. Elect.	4	4
Elective	5	2½	Elective	4	4	Elective	4	4
			Elective	4	4	Elective	4	4
	15	7½		16	16		16	16

FOURTH YEAR

TERM 10* Course	Cl.	Cr.	TERM 11 Course	Cl.	Cr.	TERM 12 Course	Cl.	Cr.
Elective	5	2½	Hist. Elect.	4	4	Hist. Elect.	4	4
Elective	5	2½	Hist. Elect.	4	4	Hist. Elect.	4	4
Elective	5	2½	Elective	4	4	Elective	4	4
			Elective	4	4	Elective	4	4
	15	7½		16	16		16	16

FIFTH YEAR

TERM 13* Course	Cl.	Cr.	No.	TERM 14 Course	Cl.	Cr.	TERM 15 Course	Cl.	Cr.
Elective	5	2½		Hist. Elect.	4	4	Hist. Elect.	4	4
Elective	5	2½		Hist. Elect.	4	4	Hist. Elect.	4	4
Elective	5	2½		Elective	4	4	Elective	4	4
				Elective	4	4	Elective	4	4
			50.20	Place. Tech.	2	1			
	15	7½			18	17		16	16

*Summer term—5 weeks.   ( ) indicate laboratory hours.

NOTE — History electives must include eight credit hours from the following areas: (1) Ancient, Medieval, or Early European; (2) Modern Europe; (3) British North American Colonies and United States; (4) other areas.

MATHEMATICS

FIRST YEAR

No.	TERM 1 Course	Cl.	Cr.	No.	TERM 2 Course	Cl.	Cr.	No.	TERM 3 Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
11.01	Gen. Chem.	3(3)	4	11.02	Gen. Chem.	3(3)	4	11.03	Gen. Chem.	3(3)	4
14.61	Math. Anal.	5	5	14.62	Math. Anal.	5	5	14.63	Math. Anal.	5	5
15.51	Physics	3	3	15.52	Physics	3	3	15.53	Physics	3	3
	Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3
16.10	Phys. Ed. or			16.11	Phys. Ed. or			16.12	Phys. Ed. or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		17(3)	**18**			**17(3)**	**18**			**17(3)**	**18**

SECOND YEAR

No.	TERM 4* Course	Cl.	Cr.	No.	TERM 5 Course	Cl.	Cr.	No.	TERM 6 Course	Cl.	Cr.
11.04	Gen. Chem.	3(3)	2	30.33	Eng. Lit.	4	4	30.34	Eng. Lit.	4	4
14.64	Math. Anal.	5	2½	14.65	Math. Anal.	4	4	14.66	Math. Anal.	4	4
15.54	Physics	5	2½	15.55	Physics	4(3)	5	15.56	Physics	3(3)	4
	Mod. Lang. Elect.	3	1½		Mod. Lang. Elect.	4	4		Mod. Lang. Elect.	4	4
		16(3)	**8½**			**16(3)**	**17**			**15(3)**	**16**

THIRD YEAR

No.	TERM 7* Course	Cl.	Cr.	No.	TERM 8 Course	Cl.	Cr.	No.	TERM 9 Course	Cl.	Cr.
14.11	Theory of Eq. or	5	2½	14.07	Diff. Equa.	4	4	14.08	Diff. Equa.	4	4
14.13	Comp't Prog.	4(2)	2½	14.31	Geometries	4	4	14.17	Inf. Series	4	4
	Elective	5	2½		Elective	4	4		Elective	4	4
	Elective	5	2½		Elective	4	4		Elective	4	4
		15	**7½**			**16**	**16**			**16**	**16**
	or	**14(2)**	**7½**								

FOURTH YEAR

No.	TERM 10* Course	Cl.	Cr.	No.	TERM 11 Course	Cl.	Cr.	No.	TERM 12 Course	Cl.	Cr.
14.14	Hist. of Math. or	5	2½	14.15	Adv. Calc.	4	4	14.16	Adv. Calc.	4	4
14.39	Topics in Set Theory	5	2½	14.31	Geometries	4	4	14.17	Inf. Series	4	4
	Elective	5	2½		Elective	4	4		Elective	4	4
	Elective	5	2½		Elective	4	4		Elective	4	4
		15	**7½**			**16**	**16**			**16**	**16**

FIFTH YEAR

TERM 13* Course	Cl.	Cr.	No.	TERM 14 Course	Cl.	Cr.	No.	TERM 15 Course	Cl.	Cr.
Math. Elec.	5	2½	14.37	Abs. Algebra	4	4	14.38	Abs. Algebra	4	4
Elective	5	2½	14.28	Math. Stat.	4	4	14.29	Math. Stat.	4	4
Elective	5	2½		Elective	4	4		Elective	4	4
				Elective	4	4		Elective	4	4
			50.20	Place. Tech.	2	1				
	15	**7½**			**18**	**17**			**16**	**16**

*Summer term—5 weeks.   ( ) indicate laboratory hours.

MEDICAL TECHNOLOGY

FIRST YEAR

No.	TERM 1 Course	Cl.	Cr.	No.	TERM 2 Course	Cl.	Cr.	No.	TERM 3 Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
11.01	Gen. Chem.	3(3)	4	11.02	Gen. Chem.	3(3)	4	11.03	Gen. Chem.	3(3)	4
14.21	Basic Math.	3	3	14.22	Basic Math.	3	3	14.23	Basic Math.	3	3
10.01	Gen. Biol.	2(3)	3	10.02	Gen. Biol.	2(3)	3	10.03	Gen. Biol.	2(3)	3
	Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3
16.10	Phys. Ed. or			16.11	Phys. Ed. or			16.12	Phys. Ed. or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		14(6)	16			14(6)	16			14(6)	16

SECOND YEAR

No.	TERM 4* Course	Cl.	Cr.	No.	TERM 5 Course	Cl.	Cr.	No.	TERM 6 Course	Cl.	Cr.
10.04	Gen. Biol.	3(3)	2	10.31	Hematology	3(3)	4	10.32	Human Anat.	3(3)	4
10.30	Intro. Med. Tech.	6	3	11.26	Org. Chem.	3(3)	4	11.27	Org. Chem.	3(3)	4
11.04	Gen. Chem.	3(3)	2	25.09	Statistics	4	4	25.10	Statistics	4	4
	Mod. Lang. Elect.	3	1½		Mod. Lang. Elect.	4	4		Mod. Lang. Elect.	4	4
		15(6)	8½			14(6)	16			14(6)	16

THIRD YEAR

TERM 7*	Cl.	Cr.	No.	TERM 8 Course	Cl.	Cr.	No.	TERM 9 Course	Cl.	Cr.
Elective	5	2½	10.20	Basic Micro.	3(3)	4	10.21	Basic Micro.	3(3)	4
Elective	5	2½	10.59	An. Histol.	3(3)	4	10.60	An. Histol.	3(3)	4
Elective	5	2½	11.28	Org. Chem.	4(3)	5	11.45	Biol. Chem.	4	4
				Elective	4	4		Elective	4	4
	15	7½			14(9)	17			14(6)	16

FOURTH YEAR

TERM 10*	Cl.	Cr.	No.	TERM 11 Course	Cl.	Cr.	No.	TERM 12 Course	Cl.	Cr.
Elective	5	2½	11.17	Quant. Anal.	3(3)	4	11.18	Quant. Anal.	2(3)	3
Elective	5	2½	15.11	Gen. Phys.	4	4		Elective	4	4
Elective	5	2½		Elective	4	4		Elective	4	4
				Elective	4	4		Elective	4	4
	15	7½			15(3)	16			14(3)	15

FIFTH YEAR

TERM 13*	Cl.	Cr.	No.	TERM 14 Course	Cl.	Cr.	No.	TERM 15 Course	Cl.	Cr.
Elective	5	2½	10.63	Cell Physiol.	3(3)	4	10.64	Cell Physiol.	3(3)	4
Elective	5	2½	15.12	Gen. Phys.	3(3)	5	15.13	Gen. Phys.	3(3)	5
Elective	5	2½		Elective	4	4	11.41	Chem. Lit.	3	3
				Elective	4	4		Elective	4	4
			50.20	Place. Tech.	2	1				
	15	7½			16(6)	18			13(6)	16

*Summer term—5 weeks. ( ) indicate laboratory hours.

MODERN LANGUAGES

FIRST YEAR

TERM 1			TERM 2			TERM 3		
No. Course	Cl.	Cr.	No. Course	Cl.	Cr.	No. Course	Cl.	Cr.
30.01 English	3	3	30.02 English	3	3	30.03 English	3	3
23.01 West. Civ.	4	4	23.02 West. Civ.	4	4	23.03 West. Civ.	4	4
22.41 Intro. to			22.42 Intro. to			22.43 Intro. to		
Pol. Sci.	3	3	Pol. Sci.	3	3	Pol. Sci.	3	3
17.01 Surv. Phys. Sci.	3	3	17.02 Surv. Phys. Sci.	3	3	17.03 Surv. Phys. Sci.	3	3
Mod. Lang.			Mod. Lang.			Mod. Lang.		
Elect.	3	3	Elect.	3	3	Elect.	3	3
16.10 Phys. Ed.			16.11 Phys. Ed.			16.12 Phys. Ed.		
or			or			or		
61.01 ROTC (Basic)			61.02 ROTC (Basic)			61.03 ROTC (Basic)		
	16	16		16	16		16	16

SECOND YEAR

TERM 4*			TERM 5			TERM 6		
17.04 Surv. Phys.			20.06 Ec. Prin. &			20.07 Ec. Prin. &		
Sci.	4	2	Prob.	4	4	Prob.	4	4
23.04 West. Civ.	4	2	23.17 U.S. to 1865	4	4	23.18 U.S. since 1865	4	4
Mod. Lang.			30.33 Eng. Lit.	4	4	30.34 Eng. Lit.	4	4
Elect.	3	1½	Mod. Lang.			Mod. Lang.		
30.04 Intro. to Lit.	5	2½	Elect.	4	4	Elect.	4	4
	16	8		16	16		16	16

THIRD YEAR

TERM 7*			TERM 8			TERM 9		
Elective	5	2½	Mod. Lang.			Mod. Lang.		
Elective	5	2½	Elect.	4	4	Elect.	4	4
Elective	5	2½	Mod. Lang.			Mod. Lang.		
			Elect.	4	4	Elect.	4	4
			Elective	4	4	Elective	4	4
			Elective	4	4	Elective	4	4
	15	7½		16	16		16	16

FOURTH YEAR

TERM 10*			TERM 11			TERM 12		
Elective	5	2½	Mod. Lang.			Mod. Lang.		
Elective	5	2½	Elect.	4	4	Elect.	4	4
Elective	5	2½	Mod. Lang.			Mod. Lang.		
			Elect.	4	4	Elect.	4	4
			Elective	4	4	Elective	4	4
			Elective	4	4	Elective	4	4
	15	7½		16	16		16	16

FIFTH YEAR

TERM 13*			TERM 14			TERM 15		
Elective	5	2½	Mod. Lang.			Mod. Lang.		
Elective	5	2½	Elect.	4	4	Elect.	4	4
Elective	5	2½	Mod. Lang.			Mod. Lang.		
			Elect.	4	4	Elect.	4	4
			Elective	4	4	Elective	4	4
			Elective	4	4	Elective	4	4
			50.20 Place. Tech.	2	1			
	15	7½		18	17		16	16

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*Summer term—5 weeks.   ( ) indicate laboratory hours.

NOTE — Modern language electives must include not less than 32 credit hours of advanced courses in one language and not more than 16 credit hours of advanced courses in a second language.

PHYSICS

FIRST YEAR

No.	TERM 1 Course	Cl.	Cr.	No.	TERM 2 Course	Cl.	Cr.	No.	TERM 3 Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
11.01	Gen. Chem.	3(3)	4	11.02	Gen. Chem.	3(3)	4	11.03	Gen. Chem.	3(3)	4
14.61	Math. Anal.	5	5	14.62	Math. Anal.	5	5	14.63	Math. Anal.	5	5
15.51	Physics	3	3	15.52	Physics	3	3	15.53	Physics	3	3
	Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3
16.10	Phys. Ed. or			16.11	Phys. Ed. or			16.12	Phys. Ed. or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		17(3)	18			17(3)	18			17(3)	19

SECOND YEAR

No.	TERM 4* Course	Cl.	Cr.	No.	TERM 5 Course	Cl.	Cr.	No.	TERM 6 Course	Cl.	Cr.
11.04	Gen. Chem.	3(3)	2	30.33	Eng. Lit.	4	4	30.34	Eng. Lit.	4	4
14.64	Math. Anal.	5	2½	14.65	Math. Anal.	4	4	14.66	Math. Anal.	4	4
15.54	Physics	5	2½	15.55	Physics	4(3)	5	15.56	Physics	3(3)	4
	Mod. Lang. Elect.	3	1½		Mod. Lang. Elect.	4	4		Mod. Lang. Elect.	4	4
		16(3)	8½			16(3)	17			15(3)	16

THIRD YEAR

No.	TERM 7* Course	Cl.	Cr.	No.	TERM 8 Course	Cl.	Cr.	No.	TERM 9 Course	Cl.	Cr.
	Elective	5	2½	15.64	Electronics	3(3)	4	15.16	Elect. & Mag.	3	3
	Elective	5	2½	15.17	Mechanics	4	4	15.18	Mechanics	4	4
	Elective	5	2½	14.07	Diff. Equa.	4	4	15.66	Adv. Electr. Lab.	1(3)	2
					Elective	4	4	14.08	Diff. Equa.	4	4
									Elective	4	4
		15	7½			15(3)	16			16(3)	17

FOURTH YEAR

No.	TERM 10* Course	Cl.	Cr.	No.	TERM 11 Course	Cl.	Cr.	No.	TERM 12 Course	Cl.	Cr.
	Elective	5	2½	15.26	Mod. Physics	4	4	15.27	Mod. Physics	4	4
	Elective	5	2½	15.62	Vib. & Sound	3(3)	4	15.61	Optics	3(3)	4
	Elective	5	2½	14.15	Adv. Calc.	4	4	14.16	Adv. Calc.	4	4
					Elective	4	4		Elective	4	4
		15	7½			15(3)	16			15(3)	16

FIFTH YEAR

No.	TERM 13* Course	Cl.	Cr.	No.	TERM 14 Course	Cl.	Cr.	No.	TERM 15 Course	Cl.	Cr.
	Elective	5	2½	15.29	Thermo.	4	4	15.34	Quant. Theory	4	4
	Elective	5	2½	15.33	Quant. Theory	4	4	15.72	Exper. Phys.	1(3)	2
	Elective	5	2½	15.71	Exper. Phys.	1(3)	2	15.76	Meth. Theo. Phys.	4	4
					Elective	4	4		Elective	4	4
				50.20	Place. Tech.	2	1				
		15	7½			15(3)	15			13(3)	14

*Summer term—5 weeks.   ( ) indicate laboratory hours.

POLITICAL SCIENCE

FIRST YEAR

No.	TERM 1 Course	Cl.	Cr.	No.	TERM 2 Course	Cl.	Cr.	No.	TERM 3 Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
23.01	West. Civ.	4	4	23.02	West. Civ.	4	4	23.03	West. Civ.	4	4
22.41	Intro. to Pol. Sci.	3	3	22.42	Intro. to Pol. Sci.	3	3	22.43	Intro. to Pol. Sci.	3	3
17.01	Surv. Phys. Sci.	3	3	17.02	Surv. Phys. Sci.	3	3	17.03	Surv. Phys. Sci.	3	3
	Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3
16.10	Phys. Ed. or			16.11	Phys. Ed. or			16.12	Phys. Ed. or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		16	16			16	16			16	16

SECOND YEAR

No.	TERM 4* Course	Cl.	Cr.	No.	TERM 5 Course	Cl.	Cr.	No.	TERM 6 Course	Cl.	Cr.
17.04	Surv. Phys. Sci.	4	2	20.06	Ec. Prin. & Prob.	4	4	20.07	Ec. Prin. & Prob.	4	4
23.04	West. Civ.	4	2	23.17	U.S. to 1865	4	4	23.18	U.S. since 1865	4	4
	Mod. Lang. Elect.	3	1½	23.11	For. Govt.	4	4	22.12	For. Govt.	4	4
30.04	Intro. to Lit.	5	2½		Mod. Lang. Elect.	4	4		Mod. Lang. Elect.	4	4
		16	8			16	16			16	16

THIRD YEAR

TERM 7*	Cl.	Cr.		TERM 8	Cl.	Cr.		TERM 9	Cl.	Cr.
Elective	5	2½	22.51	Am. Nat. Govt.	4	4	22.52	Am. Nat. Govt.	4	4
Elective	5	2½		Elective	4	4		Elective	4	4
Elective	5	2½		Elective	4	4		Elective	4	4
				Elective	4	4		Elective	4	4
	15	7½			16	16			16	16

FOURTH YEAR

TERM 10*	Cl.	Cr.		TERM 11	Cl.	Cr.		TERM 12	Cl.	Cr.
Elective	5	2½	22.20	Pub. Adm.	4	4	22.17	Int. Pol.	4	4
Elective	5	2½		Pol. Sci. Elect.	4	4		Pol. Sci. Elect.	4	4
Elective	5	2½		Elective	4	4		Elective	4	4
				Elective	4	4		Elective	4	4
	15	7½			16	16			16	16

FIFTH YEAR

TERM 13*	Cl.	Cr.		TERM 14	Cl.	Cr.		TERM 15	Cl.	Cr.
Elective	5	2½	22.13	Pol. Theory	4	4	22.14	Pol. Theory	4	4
Elective	5	2½		Pol. Sci. Elect.	4	4		Pol. Sci. Elect.	4	4
Elective	5	2½		Elective	4	4		Elective	4	4
				Elective	4	4		Elective	4	4
			50.20	Place. Tech.	2	1				
	15	7½			18	17			16	16

*Summer term—5 weeks.   ( ) indicate laboratory hours.

PSYCHOLOGY

FIRST YEAR

No.	TERM 1 — Course	Cl.	Cr.	No.	TERM 2 — Course	Cl.	Cr.	No.	TERM 3 — Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
23.01	West. Civ.	4	4	23.02	West. Civ.	4	4	23.03	West. Civ.	4	4
14.21	Basic Math.	3	3	14.22	Basic Math.	3	3	14.23	Basic Math.	3	3
10.01	Gen. Biol.	2(3)	3	10.02	Gen. Biol.	2(3)	3	10.03	Gen. Biol.	2(3)	3
	Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3		Mod. Lang. Elect.	3	3
16.10	Phys. Ed. or			16.11	Phys. Ed. or			16.12	Phys. Ed. or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		15(3)	**16**			**15(3)**	**16**			**15(3)**	**16**

SECOND YEAR

No.	TERM 4* — Course	Cl.	Cr.	No.	TERM 5 — Course	Cl.	Cr.	No.	TERM 6 — Course	Cl.	Cr.
10.04	Gen. Biol.	3(3)	2	20.06	Ec. Prin. & Prob.	4	4	20.07	Ec. Prin. & Prob.	4	4
23.04	West. Civ.	4	2	25.01a	Intro. Psych.	3(3)	4	25.02a	Gen. Psych.	3(3)	4
	Mod. Lang. Elect.	3	1½	36.01	Prin. Anthr.	4	4	36.02	Prin. Soc.	4	4
30.04	Intro. to Lit.	5	2½		Mod. Lang. Elect.	4	4		Mod. Lang. Elect.	4	4
		15(3)	**8**			**15(3)**	**16**			**15(3)**	**16**

THIRD YEAR

No.	TERM 7* — Course	Cl.	Cr.	No.	TERM 8 — Course	Cl.	Cr.	No.	TERM 9 — Course	Cl.	Cr.
	Elective	5	2½	25.09	Statistics	4	4	25.10	Statistics	4	4
	Elective	5	2½		Psych. Elect.	4	4		Psych. Elect.	4	4
	Elective	5	2½		Elective	4	4		Elective	4	4
					Elective	4	4		Elective	4	4
		15	**7½**			**16**	**16**			**16**	**16**

FOURTH YEAR

No.	TERM 10* — Course	Cl.	Cr.	No.	TERM 11 — Course	Cl.	Cr.	No.	TERM 12 — Course	Cl.	Cr.
	Elective	5	2½	25.27	Exper. Psych.	3(3)	4	25.12	Exper. Psych.	3(3)	4
	Elective	5	2½		Psych. Elect.	4	4		Psych. Elect.	4	4
	Elective	5	2½		Elective	4	4		Elective	4	4
					Elective	4	4		Elective	4	4
		15	**7½**			**15(3)**	**16**			**15(3)**	**16**

FIFTH YEAR

No.	TERM 13* — Course	Cl.	Cr.	No.	TERM 14 — Course	Cl.	Cr.	No.	TERM 15 — Course	Cl.	Cr.
	Elective	5	2½	25.41	Hist. of Psych.	4	4	25.28	Exper. Psych.	3(3)	4
	Elective	5	2½		Psych. Elect.	4	4	25.42	Systems of Psych.	4	4
	Elective	5	2½		Elective	4	4		Elective	4	4
					Elective	4	4		Elective	4	4
				50.20	Place. Tech.	2	1				
		15	**7½**			**18**	**17**			**15(3)**	**16**

*Summer term—5 weeks.   ( ) indicate laboratory hours.

SOCIOLOGY

FIRST YEAR

TERM 1			TERM 2			TERM 3		
No. Course	Cl.	Cr.	No. Course	Cl.	Cr.	No. Course	Cl.	Cr.
30.01 English	3	3	30.02 English	3	3	30.03 English	3	3
23.01 West. Civ.	4	4	23.02 West. Civ.	4	4	23.03 West. Civ.	4	4
22.41 Intro. to Pol. Sci.	3	3	22.42 Intro. to Pol. Sci.	3	3	22.43 Intro. to Pol. Sci.	3	3
17.01 Surv. Phys. Sci.	3	3	17.02 Surv. Phys. Sci.	3	3	17.03 Surv. Phys. Sci.	3	3
Mod. Lang. Elect.	3	3	Mod. Lang. Elect.	3	3	Mod. Lang. Elect.	3	3
16.10 Phys. Ed. or 61.01 ROTC (Basic)			16.11 Phys. Ed. or 61.02 ROTC (Basic)			16.12 Phys. Ed. or 61.03 ROTC (Basic)		
	16	16		16	16		16	16

SECOND YEAR

TERM 4*			TERM 5			TERM 6		
17.04 Surv. Phys. Sci.	4	2	20.06 Ec. Prin. & Prob.	4	4	20.07 Ec. Prin. & Prob.	4	4
23.04 West. Civ.	4	2	25.01a Intro. Psych.	3(3)	4	25.02a Gen. Psych.	3(3)	4
Mod. Lang. Elect.	3	1½	36.01 Prin. Anthr.	4	4	36.02 Prin. Soc.	4	4
30.04 Intro. to Lit.	5	2½	Mod. Lang. Elect.	4	4	Mod. Lang. Elect.	4	4
	16	8		15(3)	16		15(3)	16

THIRD YEAR

TERM 7*			TERM 8			TERM 9		
Elective	5	2½	36.03 Comp. Culture	4	4	36.04 Comp. Culture	4	4
Elective	5	2½	Elective	4	4	Elective	4	4
Elective	5	2½	Elective	4	4	Elective	4	4
			Elective	4	4	Elective	4	4
	15	7½		16	16		16	16

FOURTH YEAR

TERM 10*			TERM 11			TERM 12		
Elective	5	2½	36.05 Amer. Soc.	4	4	36.06 Amer. Soc.	4	4
Elective	5	2½	36.07 Ind. & Soc.	4	4	36.08 Ind. & Soc.	4	4
Elective	5	2½	Elective	4	4	Elective	4	4
			Elective	4	4	Elective	4	4
	15	7½		16	16		16	16

FIFTH YEAR

TERM 13*			TERM 14			TERM 15		
Elective	5	2½	36.09 Soc. Res. Meth.	4	4	36.10 Soc. Res. Meth.	4	4
Elective	5	2½	36.11 Soc. Theory	4	4	36.12 Soc. Theory	4	4
Elective	5	2½	Elective	4	4	Elective	4	4
			Elective	4	4	Elective	4	4
			50.20 Place. Tech.	2	1			
	15	7½		18	17		16	16

*Summer term—5 weeks.   ( ) indicate laboratory hours.

DENTAL HYGIENE PROGRAM

FIRST YEAR
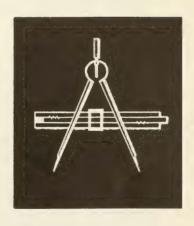
No.	TERM 1 Course	Cl.	Cr.
30.01	English	3	3
11.06	Chemistry	2(3)	3
10.05	Biology	2(3)	3
DH.30	Hygiene	2	2
DH.01	Dental Anatomy	2	2
16.10	Phys. Ed.		
DH.11	Clin. Dent. Hyg.	4(6)	6
		15(12)	**19**

No.	TERM 2 Course	Cl.	Cr.
30.02	English	3	3
11.07	Chemistry	2(3)	3
10.06	Biology	2(3)	3
DH.02	Dental Anatomy	2	2
DH.40	Nutrition	2	2
16.11	Phys. Ed.		
DH.12	Clin. Dent. Hyg.	4(6)	6
		15(12)	**19**

No.	TERM 3 Course	Cl.	Cr.
DH.41	Nutrition	2	2
DH.05	Histology	2	2
DH.20	Radiology	2	2
DH.28	Operative Dent.	2	2
DH.24	Pharmacology	2	2
16.12	Phys. Ed.		
DH.13	Clin. Dent. Hyg.	10	2
		20	**12**

No.	TERM 4 Course	Cl.	Cr.
30.03	English	3	3
11.08	Chemistry	2(3)	3
10.07	Microbiology	3(3)	4
DH.03	Dental Anatomy	2	2
DH.31	First Aid	2	2
DH.14	Clin. Dent. Hyg.	10	2
		22(6)	**16**

SECOND YEAR

No.	TERM 5 Course	Cl.	Cr.
36.35	Sociology	3	3
10.32	Anatomy	3(3)	4
DH.07	Pathology	2	2
DH.15	Clin. Dent. Hyg.	20	4
		28(3)	**13**

No.	TERM 6 Course	Cl.	Cr.
10.08	Physiology	3(3)	4
25.26	Psychology	3	3
DH.60	Dent. Pub. Hlth. & Prev. Dent.	3	3
DH.16	Clin. Dent. Hyg.	20	4
		29(3)	**14**

No.	TERM 7 Course	Cl.	Cr.
36.36	Sociology	3	3
25.27	Psychology	3	3
DH.61	Dent. Pub. Hlth. & Prev. Dent.	3	3
DH.22	Oral Surg. & Anesth.	1	1
DH.26	Periodontology	1	1
DH.17	Clin. Dent. Hyg.	20	4
		31	**15**

No.	TERM 8 Course	Cl.	Cr.
DH.23	Oral Surg. & Anesth.	2	2
DH 27	Periodontology	1	1
DH.50	Office Procedures & Ethics	2	2
DH.18	Clin. Dent. Hyg.	20	4
		25	**9**

( ) indicate laboratory hours.

College of Engineering

Dr. Ronald E. Scott, Dean
William Wallace, Assistant Dean

Aims

It is the purpose of the College of Engineering to provide educational programs which will effectively prepare students to become professional practitioners, to enter graduate schools, or to accept employment in the many industrial fields in which an engineering background is helpful. Principally concerned with undergraduate instruction, the College is operated upon the Co-operative Plan and offers five-year curricula leading to the baccalaureate degree in civil, mechanical, electrical, chemical, and industrial engineering.

The academic program begins with a 30-week freshman year of full-time study during which the student continues to build the foundation in mathematics, the physical sciences, and means of expression that were begun in high school. Co-operative work in the same general field of engineering for which he is preparing begins with the second year and continues throughout the upperclass program. Thus the student has an opportunity to gain some insight into problems of actual engineering practice as he progresses through the course of study at the College.

In keeping with recent trends in engineering education, the co-operative curricula at Northeastern comprise a balanced sequence of courses in which the technological disciplines occupy about four fifths of the student's program and the humanistic or general studies about one fifth. These two aspects of the undergraduate curriculum are integrated throughout the entire five years so that growth in cultural understanding proceeds hand in hand with development of technical knowledge and skill. This plan, widely utilized in engineering education, is quite different from that in legal or medical education, in which the general studies precede the professional training, but it has proved to be highly effective in the preparation of engineers and industrial leaders.

Methods

The courses of study in the first year are identical for all engineering students, and it is possible for a student to change his curriculum at the end of the freshman year without loss of time. Emphasis throughout all curricula is laid upon fundamental concepts and skills so that the student may develop an adequate foundation upon which to base his professional development. In the undergraduate programs relatively little time can be devoted to courses in specialized aspects of current engineering practice. These must in the main be given in graduate schools, where specialization is appropriate and possible.

Undergraduate curricula at Northeastern are designed to develop young men and women with well-balanced personal qualities, a sense of civic responsibility, an understanding of industrial job requirements, and a technical competence sufficient to begin a professional career. Instruction both in the classroom and in the laboratory is designed to place maximum emphasis upon individual initiative and responsibility and to develop the student's powers of analysis.

Because an engineering education teaches the students to search out the truth, to think clearly, and to formulate conclusions based upon a solid foundation of facts, engineers are being called upon more and more to occupy positions of responsibility in the management of our great industrial enterprises. Even in such diverse fields as banking, public health, and public administration, this so-called engineering approach is in demand.

Day graduate programs are available in the Departments of Chemical, Civil, Mechanical, Industrial, and Electrical Engineering, and of Mathematics, and Physics, leading to the master's degree. The former are co-operative programs in engineering similar to the undergraduate co-operative programs. In Physics, conventional two-year, half-time fellowships are available.

Doctoral programs are available in Electrical Engineering, Chemical Engineering, and Physics.

Part-Time Program Offered During Evening Hours

The College of Engineering also offers an eight-year curriculum leading to the degree of Bachelor of Science in Electrical Engineering. Classes are held in the evening and Saturday mornings. Admission requirements and course requirements are the same as for the degree under the Co-operative Plan. For further information consult the evening bulletin of the College of Engineering.

Power Systems Engineering

In order to meet the needs of the rapidly expanding electric-power industry, Northeastern has initiated a special program in power systems engineering. This program is an accelerated co-operative program which results in a bachelor's degree in five years or a combined bachelor's and master's degree in six years. The subject matter is basically that of electrical engineering augmented by additional work in power systems, economics, computer control, atomic energy, and direct energy conversion.

Admission Requirements

It is important that applicants for admission to the College of Engineering complete successfully the full sequence of secondary school courses in English, mathematics, and science. The following subjects are required:

Subject	Units
English (4 years)	3
Physics and Chemistry	2
Algebra (through quadratics)	2
Plane Geometry and Trigonometry	1½
Other college preparatory subjects	4½
Electives, not more than	2
	15

GRADUATION REQUIREMENTS

The College of Engineering offers five-year curricula, conducted on the Co-operative Plan, leading to the following degrees:

1. Bachelor of Science in Civil Engineering
2. Bachelor of Science in Mechanical Engineering
3. Bachelor of Science in Electrical Engineering
4. Bachelor of Science in Chemical Engineering
5. Bachelor of Science in Industrial Engineering

These curricula are described in the following pages. Since the first year is the same for all engineering students, final choice of curriculum need not be made until the beginning of the second year.

Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum in which they seek to qualify. A total of 234

credit hours (equivalent to 146 semester hours) is required for the degree. Students who undertake co-operative work assignments must meet the requirements of the Department of Co-operative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive the Bachelor of Science degree until he has completed at least one academic year at Northeastern immediately preceding his graduation.

Scholarship Requirements

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the designated field of specialization. Those who are clearly unable to meet the accepted standard of attainment will be required to withdraw from the University.

Graduation with Honor

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least three years before they may become eligible for honors at graduation.

Engineering Curricula

A brief description of each of the five engineering curricula, together with a short statement as to the principal vocational opportunities available to graduates, is given below to assist students in choosing their fields of specialization.

I. **Civil Engineering** has to do with the planning and building of all kinds of structures and public works. None of the structures of civil engineers lend themselves to quantity production in a factory. Not only are civil engineering works designed to fit a single location, but ordinarily their value is dependent upon their ability to resist forces tending to move them.

Civil engineering is as old as civilization itself and, until recent times, it embraced all phases of engineering except those of a military character. Today its major branches include topographical, municipal, railroad, highway, structural, hydraulic, and sanitary engineering. It covers land surveying, soil mechanics, the building of railroads, harbors, docks, and similar structures; the construction of sewers, water works, streets, and highways; the design and construction of flood control projects, bridges, buildings, walls, foundations, and of all fixed structures.

Since the first step in every civil engineering project involves accurate measurement of the surface features of the land, of the nature of the soil, and of the character of the underlying rock, the study of surveying and related subjects occupies a large place in the civil engineering curriculum. And since the primary consideration in designing any structure is to make certain that it will withstand safely any force to which it may be subjected, the mechanics of static bodies, strength of materials, and theory of structures are studied in detail. The curriculum is thus intended to prepare the young civil engineer to

take up the work of design and construction of structures, to solve the problems of water supply and waste disposal in urban areas, and intelligently to undertake the supervision of work in allied fields of engineering and in general contracting.

Upon graduation, the young engineer may expect a period of apprenticeship either in the field, surveying and plotting, or in the office, over the drafting board. As experience is gained, the graduate is entrusted with greater responsibilities in actual design and supervision of construction. Those who prefer a roving existence should direct their ambitions toward private fields, while those who prefer a stable home and community life will seek opportunities in the public service of the Federal Government and the various states and municipalities.

II. **Mechanical Engineering** is concerned with the harnessing of power resources by means of machinery to perform useful work. With the increasing mechanization of all industry which has taken place during the last century, the field has so broadened as to include all lines of industry.

In contrast to the civil engineer, who deals primarily with static forces, the mechanical engineer is more concerned with the mechanics of motion or kinetics. And because moving parts require constant care and adjustment, the mechanical engineer has the task not only of designing and installing complicated machinery but also of operating it efficiently after it has been installed.

The construction and operation of furnaces, boilers, and engines, the design of all kinds of machinery from pocket watches to steel boring mills, the construction and operation of railway and other transportation equipment including automobiles and airplanes, and even control of atmospheric conditions by means of heating and air conditioning equipment, all fall within the field of mechanical engineering.

Since machinery is so predominantly the concern of the mechanical engineer, the program of study is designed to give the student considerable training in the principles underlying the design and operation of engines, power transmission devices, machine tools, and other machinery. This, of course, implies a thorough study of the physical laws concerning motion and transfer of energy. Applied mechanics and thermodynamics occupy a prominent place in the curriculum. The program of instruction thus gives the student a broad foundation in those fundamental subjects essential to all engineering practice and, in the senior year, provides for limited specialization.

For those students desiring to specialize in the field of industrial management, attention is called to the curriculum in industrial engineering, the basic training of which is essentially the same as that in mechanical engineering.

The graduate mechanical engineer generally finds employment in an industrial plant, either in design and research or in plant operation and maintenance. And if his abilities lie in that direction, he frequently is entrusted after a time with greater and greater responsibility for the successful management of the enterprise.

III. **Electrical Engineering** is a fast-moving field, obtaining much of its impetus from the contemporary pioneering developments in the pure sciences. For this reason, the program of study in electrical engineering includes more work in

physics and mathematics than do the other programs and provides a solid grounding in engineering fundamentals as well.

The field of electrical engineering, and the electrical industry which it services, are usually divided into two main areas — power and communications. These areas overlap in that both are concerned with electronics and control. The electrical engineering curriculum therefore, includes courses in the generation, transmission, and distribution of electrical energy for light and power purposes; the design and development of communications equipment such as telephones, radio, television, and radar; the development and operation of large-scale data-processing equipment and analog and digital computers; servo-mechanisms, etc. To provide the abstract ground necessary for these undertakings, courses covering Laplace transforms, field theory, and solid-state physics are included.

The profession of electrical engineering affords a wide diversification of employment opportunities. If one is research-minded, opportunity to develop one's talents may be found in one of the great university or industrial laboratories; if one is interested in industrial applications or plant problems, opportunity can be found in the manufacturing or operating organizations; and if one is sales-minded, he may find a career as a sales engineer.

IV. Chemical Engineering has grown out of the discoveries in the chemical laboratories which have served as a foundation for a great many new industries whose production processes involve chemical as well as physical changes. Petroleum refining, coal carbonization, plastics, manufacture of nylon and cellophane, and hundreds of other industries require men and women trained in chemistry as well as in engineering. Moreover, much of the training received by the chemical engineer is now being applied in the rapidly developing field of nuclear engineering. Many older industries, such as foods, textiles, paints and varnishes, and leather, are also employing chemical engineers.

The chemical engineer has been defined as a "professional man experienced in the design, construction, and operation of plants in which materials undergo chemical and physical change." It is the task of the chemical engineer to reduce the costs, increase production, and improve the quality of the products in the industry.

In addition to the fundamental courses in chemistry, mathematics, and physics required of all engineering students, a considerable amount of time is devoted to more advanced work in chemistry as a foundation for the study of chemical technology. In recognition of the increasing interest in the production and utilization of nuclear energy, a course in modern physics and a course in the introduction to nuclear engineering recently have been added to the curriculum. Instruction in the elements of mechanical and electrical engineering also helps to give the student a sound engineering background. Since the field of chemical engineering is so varied, the curriculum has been designed to give the students a broad training in which fundamental principles are stressed. It is believed that this training will enable the students readily to acclimate themselves to whatever industry they may choose to enter.

Because of the complex nature of many chemical processes and because of the difficulty of translating laboratory results into full-scale plant operations, there has been developed in many chemical plants the so-called semi-works or pilot plant. Here new processes developed by the chemists in the research

laboratory are put to the test of actual plant conditions. And it is here that the young chemical engineers often find themselves upon graduation. If they are able to understand the chemist on the one side and the plant operator on the other, and if they are technically competent as well, they will soon find opportunities for advancement either in one of the technical branches of the industry, such as design, development, research, and production, or in the sales and management fields in which a knowledge of chemical engineering is essential.

V. Industrial Engineering is concerned with the application of engineering and scientific principles to the varied problems in the field of production management involving the intelligent utilization of men, materials, machines, and money.

About sixty years ago, Frederick W. Taylor undertook to apply to the problems of industrial management what we now call "the scientific method" or "the engineering approach." He reasoned that it was management's business to know what constituted a proper day's work and that the way to get the facts was through research and experiment on a scientific basis. He defined "scientific management" not as any device or scheme or gadget, but as a new outlook — a new viewpoint based upon a solid foundation of fact. The methods employed by Taylor and by those who came after him have undergone some modification, but the concept of scientific management which he formulated has gained wider and wider recognition from both employers and employees.

This growing recognition of the value of a scientific approach to the problems of industrial management early created a demand for men and women trained in engineering and science, who possessed a knowledge of business as well, to assume positions of administrative responsibility in industry. To meet this demand, courses were established in many engineering colleges to provide a thorough training in engineering fundamentals, together with a specialized training in business administration which would prepare the students for managerial responsibilities in technical industries. These curricula are variously entitled industrial engineering, administrative engineering, and engineering administration, and all are designed to lead ultimately to positions of administrative or executive responsibility, rather than to positions which involve highly specialized technical engineering responsibility.

The curriculum in industrial engineering, then, provides a course of study which is essentially the same as that for mechanical engineering in the first three years. In the last two years, however, advanced engineering courses are replaced by courses in business management.

Upon graduation, the young industrial engineer may find his way into such factory staff departments as methods engineering, production planning and control, wage administration, quality control, and time study. If he prefers, he may select work in cost accounting or statistical analysis; then again he may incline towards sales engineering activity and serve in the field as a sales and service representative.

More and more there is opportunity for the experienced industrial engineer to serve industry in a consulting capacity. Upon becoming especially skilled in his profession, he is called in by industry for assistance in the installation and maintenance of sound management principles, and in the reorganization of enterprises which have failed.

CIVIL ENGINEERING

FIRST YEAR

TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
11.01	Gen. Chem.	4	4	11.02	Gen. Chem.	4	4	11.03	Gen. Chem.	4	4
12.51	Eng. Graphics	3(3)	3	12.52	Eng. Graphics	3(3)	3	12.53	Eng. Graphics	3(3)	3
14.61	Math. Anal.	5	5	14.62	Math. Anal.	5	5	14.63	Math. Anal.	5	5
15.51	Physics	3	3	15.52	Physics	3	3	15.53	Physics	3	3
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
16.10	Phys. Ed.			16.11	Phys. Ed.			16.12	Phys. Ed.		
	or				or				or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		18(3)	**18**			**18(3)**	**18**			**18(3)**	**18**

SECOND YEAR

TERM 4*				TERM 5				TERM 6		
11.04	Gen. Chem.	4	2	1.10	Surveying	3(3)	3	2.20	App. Mech.	4	4
12.54	Eng. Graph.	3(3)	2	3.01	Elect. Eng.	3	3	3.02	Elect. Eng.	3	3
14.64	Math. Anal.	5	2½	14.65	Math. Anal.	4	4	14.66	Math. Anal.	4	4
15.54	Physics	5	2½	15.55	Physics	4(3)	5	15.56	Physics	3(3)	4
				22.04	Mod. Dem.	3	3	22.05	Mod. Dem.	3	3
		17(3)	**9**			**17(6)**	**18**			**17(3)**	**18**

THIRD YEAR

TERM 7*				TERM 8				TERM 9		
2.21	App. Mech.	6	3	1.11	Surveying	4(3)	4	1.20	Hydraulics	3	3
30.15	Literature	6	3	2.22	Str. of Mat.	4	4	1.80	Mat. Constr.	3	3
25.07	Psychology	6	3	3.03	Elect. Eng.	3	3	2.23	Str. of Mat.	3	3
	or			14.67	Math. Anal.	4	4	2.80	Heat. Eng.	4	4
23.52	Contemp. Eur.	6	3	20.11	Economics	3	3	14.68	Mat. Anal.	3	3
								20.12	Economics	3	3
		18	**9**			**18(3)**	**18**			**19**	**19**

FOURTH YEAR

TERM 10*				TERM 11				TERM 12		
1.14	Surveying	6(6)	3	1.21	Hydraulics	3	3	1.41	Struct. Anal.	4	4
30.16	Literature	6	3	1.40	Struct. Anal.	3	3	1.50	Concrete	3	3
25.08	Psychology	6	3	1.49	Conc. T. Lab.	1(4)	3	1.54	Des. Struct.	3	2
	or			1.70	Geology	3	3	1.71	Eng. Geol.	3	3
23.05	Rec. Am. Hist.	6	3	2.24	Adv. Mech.	3	3	2.64	Test. Mat. Lab.	1(4)	3
					Lib. Elect.	3	3		Lib. Elect.	3	3
		18(6)	**9**			**16(4)**	**18**			**17(4)**	**18**

FIFTH YEAR

TERM 13*				TERM 14				TERM 15		
29.03	Eff. Speak.	6	3	1.91	M&S Eng. II	4	4	1.92	M&S Eng. III	3	3
1.90	M&S Eng. I	6	3	1.42	Str. Analy.	3	3	1.30	Trans.	4	4
	Lib. Elect.	6	3	1.51	Concrete	4	4	1.43	Str. Analy.	4	4
				1.55	Des. Struct.	3	3	1.56	*Des. Struct.	3(3)	4
				1.72	Soil Mech.	4	4	1.60	Constr. Eng.	3	3
				50.01	Prof. Dev.	3	1				
		18	**9**			**21**	**19**			**17(3)**	**18**

*Optional Elective
1.93 M&S Eng. IV   3(3)   4

*Summer term—5 weeks.   ( ) indicate laboratory hours.

MECHANICAL ENGINEERING

FIRST YEAR

TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
11.01	Gen. Chem.	4	4	11.02	Gen. Chem.	4	4	11.03	Gen. Chem.	4	4
12.51	Eng. Graphics	3(3)	3	12.52	Eng. Graphics	3(3)	3	12.53	Eng. Graphics	3(3)	3
14.61	Math. Anal.	5	5	14.62	Math. Anal.	5	5	14.63	Math. Anal.	5	5
15.51	Physics	3	3	15.52	Physics	3	3	15.53	Physics	3	3
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
16.10	Phys. Ed.			16.11	Phys. Ed.			16.12	Phys. Ed.		
	or				or				or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		18(3)	18			18(3)	18			18(3)	18

SECOND YEAR

TERM 4*				TERM 5				TERM 6		
11.04	Gen. Chem.	4	2	3.01	Elect. Eng.	3	3	2.20	App. Mech.	4	4
12.54	Eng. Graph.	3(3)	2	14.65	Math. Anal.	4	4	3.02	Elect. Eng.	3	3
14.64	Math. Anal.	5	2½	15.55	Physics	4(3)	5	14.66	Math. Anal.	4	4
15.54	Physics	5	2½	22.04	Mod. Dem.	3	3	15.56	Physics	3(3)	4
				30.15	Literature	3	3	22.05	Mod. Dem.	3	3
		17(3)	9			17(3)	18			17(3)	18

THIRD YEAR

TERM 7*				TERM 8				TERM 9		
2.21	App. Mech.	6	3	2.22	Str. of Mat.	4	4	1.20	Hydraulics	3	3
30.16	Literature	6	3	2.81	Heat Eng.	4	4	2.13	Mechanism	3	3
25.07	Psychology	6	3	3.03	Elect. Eng.	3	3	2.23	Str. of Mat.	3	3
	or			14.67	Math. Anal.	4	4	2.82	Heat Eng.	3	3
23.52	Contemp. Eur.	6	3	20.11	Economics	3	3	14.68	Math. Anal.	3	3
								20.12	Economics	3	3
		18	9			18	18			18	18

FOURTH YEAR

TERM 10*				TERM 11				TERM 12		
1.48	Structures	6	3	2.24	Adv. Mech.	3	3	2.28	Fluid Mech.	3	3
2.83	Heat Eng.	6	3	2.27	Fluid Mech.	3	3	2.43	Mat. & Proc.	3	3
25.08	Psychology	6	3	2.84	Heat Eng.	4	4	2.61	Mech. E. Lab.	0(3)	2
	or			2.60	Mech. E. Lab.	0(3)	2	2.85	Heat Eng.	4	4
23.05	Rec. Am. Hist.	6	3	5.10	Ind. Mgt.	3	3	5.11	Ind. Mgt.	3	3
					Lib. Elect.	3	3		Lib. Elect.	3	3
		18	9			16(3)	18			16(3)	18

FIFTH YEAR

TERM 13*				TERM 14				TERM 15		
2.46	Metal Proc.	4(6)	3	2.14	Mach. Design	3(2)	4	2.16	Prin. Feedback Control	3	3
2.88	Intro. Nucl. Eng.	6	3	2.44	Phys. Met.	3(3)	4	2.86	Heat Eng.	3	3
	Lib. Elect.	6	3	2.29	Ex. Stress Anal.	4	4	2.15	Mach. Design	3(2)	4
					or			2.26	Eng. Dyn.	3	3
				2.87	Power Plant Eng.	4	4	2.63	Mech. Eng. Lab.	0(4)	3
				2.62	Mech. Eng. Lab.	0(4)	3	2.89	Nucl. Eng.	4	4
				29.03	Eff. Speak.	3	3				
				50.01	Prof. Devel.	3	1				
		16(6)	9			16(9)	19			13(6)	17

*Summer term—5 weeks.   ( ) indicate laboratory hours.

ELECTRICAL ENGINEERING

FIRST YEAR

	TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
11.01	Gen. Chem.	4	4	11.02	Gen. Chem.	4	4	11.03	Gen. Chem.	4	4
12.51	Eng. Graphics	3(3)	3	12.52	Eng. Graphics	3(3)	3	12.53	Eng. Graphics	3(3)	3
14.61	Math. Anal.	5	5	14.62	Math. Anal.	5	5	14.63	Math. Anal.	5	5
15.51	Physics	3	3	15.52	Physics	3	3	15.53	Physics	3	3
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
16.10	Phys. Ed.			16.11	Phys. Ed.			16.12	Phys. Ed.		
	or				or				or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		18(3)	18			18(3)	18			18(3)	18

SECOND YEAR

	TERM 4*				TERM 5				TERM 6		
11.04	Gen. Chem.	4	2	3.51	Elect. Eng.	3	3	2.20	App. Mech.	4	4
12.54	Eng. Graph.	3(3)	2	14.65	Math. Anal.	4	4	3.52	Elect. Eng.	3	3
14.64	Math. Anal.	5	2½	15.55	Physics	4(3)	5	14.66	Math. Anal.	4	4
15.54	Physics	5	2½	22.04	Mod. Dem.	3	3	15.56	Physics	3(3)	4
				30.15	Literature	3	3	22.05	Mod. Dem.	3	3
		17(3)	9			17(3)	18			17(3)	18

THIRD YEAR

	TERM 7*				TERM 8				TERM 9		
2.21	App. Mech.	6	3	2.22	Str. of Mat.	4	4	2.80	Heat. Eng.	4	4
3.53	Elect. Eng	6	3	15.65	Solid State			3.09	Trans. Lines	3	3
25.07	Psychology	6	3		Phys. Elec.	3	3	3.70	Electronics	3	3
	or			3.54	Elect. Eng.	4	3	14.68	Math. Anal.	3	3
23.52	Contemp. Eur.	6	3	14.67	Math. Anal.	4	4	20.12	Economics	3	3
				20.11	Economics	3	3	30.16	Literature	3	3
		18	9			18	17			19	19

FOURTH YEAR

	TERM 10*				TERM 11				TERM 12		
3.90	Elect. Eng.			3.19	Field Theory	3	3	3.55	Elect. Mach.	3	3
	Lab.	0(6)	3	3.71	Electronics	3	3	3.92	Elect. Eng.		
3.59	Sig. Anal. &			3.80	Transients	3	3		Lab.	0(3)	3
	Linear Sys.	6	3	5.03	Ind. Mgt.	3	3	3.93	Elect. Eng.		
25.08	Psychology	6	3	3.91	Elect. Eng.				Lab.	0(3)	3
	or				Lab.	0(3)	3	3.29	Field Theory	3	3
23.05	Rec. Am. Hist.	6	3		Lib. Elect.	3	3	3.72	Electronics	3	3
									Lib. Elect.	3	3
		12(6)	9			15(3)	18			12(6)	18

FIFTH YEAR

	TERM 13*				TERM 14				TERM 15		
3.94	Elect. Eng.			3.39	Field Theory	4	4	3.57	Elect. Mach.	3	3
	Lab.	0(12)	6	3.56	Elect. Mach.	3	3	3.74	Electronics	3	3
	Lib. Elect.	6	3	3.73	Electronics	3	3	3.32	Filters	3	3
				3.60	Servo Mech.	3	3	3.96	Elect. Eng.		
				3.95	Elect. Eng.				Lab.	0(3)	3
					Lab.	0(3)	4	29.03	Eff. Speak.	3	3
				50.01	Prof. Dev.	3	1	1.26	Fluid Mech.	3	3
		6(12)	9			16(3)	18			15(3)	18

*Summer term—5 weeks.   ( ) indicate laboratory hours.

CHEMICAL ENGINEERING

FIRST YEAR

TERM 1

No.	Course	Cl.	Cr.
11.01	Gen. Chem.	3(3)	4
12.51	Eng. Graphics	3(3)	3
14.61	Math. Anal.	5	5
15.51	Physics	3	3
30.01	English	3	3
16.10	Phys. Ed.		
	or		
61.01	ROTC (Basic)		
		17(6)	18

TERM 2

No.	Course	Cl.	Cr.
11.02	Gen. Chem.	3(3)	4
12.52	Eng. Graphics	3(3)	3
14.62	Math. Anal.	5	5
15.52	Physics	3	3
30.02	English	3	3
16.11	Phys. Ed.		
	or		
61.02	ROTC (Basic)		
		17(6)	18

TERM 3

No.	Course	Cl.	Cr.
11.03	Gen. Chem.	3(3)	4
12.53	Eng. Graphics	3(3)	3
14.63	Math. Anal.	5	5
15.53	Physics	3	3
30.03	English	3	3
16.12	Phys. Ed.		
	or		
61.03	ROTC (Basic)		
		17(6)	18

SECOND YEAR

TERM 4*

No.	Course	Cl.	Cr.
11.04	Gen. Chem.	3(3)	2
4.50	Intro. to Chem. Eng.	4	2
14.64	Math. Anal.	5	2½
15.54	Physics	5	2½
		17(3)	9

TERM 5

No.	Course	Cl.	Cr.
11.51	Org. Chem.	3(3)	4
14.65	Math. Anal.	4	4
15.55	Physics	4(3)	5
4.51	Chem. Eng. Lit.	1	1
22.04	Mod. Dem.	3	3
		15(6)	17

TERM 6

No.	Course	Cl.	Cr.
11.54	Org. Chem.	3(3)	4
14.66	Math. Anal.	4	4
15.56	Physics	3(3)	4
2 20	App. Mech.	4	4
22.05	Mod. Dem.	3	3
		17(6)	19

THIRD YEAR

TERM 7*

No.	Course	Cl.	Cr.
2.21	App. Mech.	6	3
4.60	Fluid Mech.	5(3)	3
25.07	Psychology	6	3
	or		
23.52	Contemp. Eur.	6	3
		17(3)	9

TERM 8

No.	Course	Cl.	Cr.
2.22	Str. of Mat.	4	4
11.61	Phys. Chem.	3(3)	4
30.15	Literature	3	3
14.67	Math. Anal.	4	4
20.11	Economics	3	3
		17(3)	18

TERM 9

No.	Course	Cl.	Cr.
4.52	Chem. E. Calc.	4	4
11.62	Phys. Chem.	3(3)	4
15.41	Intro. At. & Nucl. Phys.	4	4
14.68	Math. Anal.	3	3
20.12	Economics	3	3
		17(3)	18

FOURTH YEAR

TERM 10*

No.	Course	Cl.	Cr.
4.70	Heat. Trans.	5(3)	3
29.03	Eff. Speak.	6	3
25.08	Psychology	6	3
	or		
23.05	Rec. Am. Hist.	6	3
		17(3)	9

TERM 11

No.	Course	Cl.	Cr.
11.65	Phys. Chem.	3	3
4.71	Chem. Eng.	4(4)	6
4.61	Chem. Eng. Therm.	3	3
11.73	Anal. Chem.	2(3)	3
	Lib. Elect.	3	3
		15(7)	18

TERM 12

No.	Course	Cl.	Cr.
11.56	Org. Chem.	3	3
4.72	Chem. Eng.	4(4)	6
4.62	Chem. Eng. Therm.	4	4
4.42	Prop. of Mat.	2	2
	Lib. Elect.	3	3
		16(4)	18

FIFTH YEAR

TERM 13*

No.	Course	Cl.	Cr.
4.80	Proc. Eng. Ec.	6	3
30.16	Literature	6	3
	Lib. Elect.	6	3
		18	9

TERM 14

No.	Course	Cl.	Cr.
3.04	Elect. Eng.	3(3)	4
4.63	Chem. Eng. Kinet.	4	4
4.43	Eng. Mat.	3	3
4.91	Process Des.	1(6)	6
	or		
4.93	Projects	1(6)	6
50.01	Prof. Dev.	3	1
		14(9)	18

TERM 15

No.	Course	Cl.	Cr.
3.05	Elect. Eng.	3	3
4.46	Int. Nucl. Eng.	4	4
4.82	Chem. Plant Costs	3	3
4.92	Process Des.	0(6)	5
	or		
4.94	Projects	0(6)	5
4.44	Ind. Processes	3	3
		13(6)	18

*Summer term—5 weeks.   ( ) indicate laboratory hours.

INDUSTRIAL ENGINEERING

FIRST YEAR

TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
11.01	Gen. Chem.	4	4	11.02	Gen. Chem.	4	4	11.03	Gen. Chem.	4	4
12.51	Eng. Graphics	3(3)	3	12.52	Eng. Graphics	3(3)	3	12 53	Eng. Graphics	3(3)	3
14.61	Math. Anal.	5	5	14.62	Math. Anal.	5	5	14.63	Math. Anal.	5	5
15.51	Physics	3	3	15.52	Physics	3	3	15.53	Physics	3	3
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
16.10	Phys. Ed.			16.11	Phys. Ed.			16.12	Phys. Ed.		
	or				or				or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		18(3)	**18**			**18(3)**	**18**			**18(3)**	**18**

SECOND YEAR

TERM 4*				TERM 5				TERM 6		
11.04	Gen. Chem.	4	2	3.01	Elect. Eng.	3	3	2.20	App. Mech.	4	4
12.54	Eng. Graph.	3(3)	2	14.65	Math. Anal.	4	4	3.02	Elect. Eng.	3	3
14.64	Math. Anal.	5	2½	15.55	Physics	4(3)	5	14.66	Math. Anal.	4	4
15.54	Physics	5	2½	22.04	Mod. Dem.	3	3	15.56	Physics	3(3)	4
				30.15	Literature	3	3	22.05	Mod. Dem.	3	3
		17(3)	**9**			**17(3)**	**18**			**17(3)**	**18**

THIRD YEAR

TERM 7*				TERM 8				TERM 9		
2.21	App. Mech.	6	3	2.22	Str. of Mat.	4	4	1.20	Hydraulics	3	3
30.16	Literature	6	3	2.81	Heat Eng.	4	4	2.23	Str. of Mat.	3	3
25.07	Psychology	6	3	5.10	Ind. Mgt.	3	3	2.82	Heat Eng.	3	3
	or			14.67	Math. Anal.	4	4	3.03	Elect. Eng.	3	3
23.52	Contemp. Eur.	6	3	20.11	Economics	3	3	5.11	Ind. Mgt.	3	3
								20.12	Economics	3	3
		18	**9**			**18**	**18**			**18**	**18**

FOURTH YEAR

TERM 10				TERM 11				TERM 12		
5.08	Prob. Theory	4(2)	3	1.21	Hydraulics	3	3	2.13	Mechanism	3	3
5.22	Proc. Plan. &	5(5)	3	2.43	Mat. & Proc.	3	3	5.13	Meth. Time An.	3(3)	4
	Tool Design			5.09	Stat. Inf.	2(2)	3	5.18	Qual. Control	3(2)	3
25.08	Psychology	6	3	5.12	Meth. Time			41.35	Ind. Acct.	5	5
	or				Anal.	3(3)	4		Lib. Elect.	3	3
23.05	Rec. Am. Hist.	6	3	41.34	Ind. Acct.	3	3				
					Lib. Elect.	3	3				
		15(7)	**9**			**17(5)**	**19**			**17(5)**	**18**

FIFTH YEAR

TERM 13*				TERM 14				TERM 15		
2.44	Phys. Met.	5(6)	3½	5.17	Prod. Plan. &			5.20	Pers. Admin.	3	3
14.30	Finite Math.	6	2½		Cont.	3	3	5.23	Plant Layout &		
	Lib. Elect.	6	3	5.19	Pers. Admin.	3	3		Mat. Hdlg.	3(3)	4
				5.24	Ind. Eng. Lab.	0(4)	3	5.25	Eng. Ec.	4	4
				5.27	Operations			5.26	Seminar	2	2
					Research	3(2)	4	5.28	Oper. Res.		
				29.03	Eff. Speak.	3	3		Prob.	2	2
				50.01	Prof. Dev.	3	1	46.03	Contracts &		
									Agency	3	3
		17(6)	**9**			**15(6)**	**17**			**17(3)**	**18**

*Summer term—5 weeks.   ( ) indicate laboratory hours.

College of Business Administration

Dr. Roger S. Hamilton, Dean
Carlo E. Gubellini, Assistant Dean

Policy

The College of Business Administration offers programs of study to meet the needs of young men and women who are preparing for future business, industrial, and civic leadership and who seek to acquire professional competence in fields of their own choosing.

The first objective imposes the obligation upon the program of study to illuminate for the student the society in which he lives, the culture to which he is heir and trustee, and the challenges posed for himself and his country.

The second objective imposes the obligation to impart the nature of the professional obligation, the role of the professional in society, and the fundamental skills whose proper use justify the title "professional."

To accomplish these objectives the programs of study assimilate principles of modern business management and administration and integrate these with courses in the liberal arts — English (literature, writing and speaking), history, and philosophy, and the social sciences, all of which are integral and essential components of each curriculum. In addition, fundamental skills and tool subjects are dealt with in their relations to the broader context of the business firm, its role, its responsibility, and its problems.

The academic content of the different curricula in the College of Business Administration is divided roughly as follows: one quarter in liberal arts other than the social sciences, one quarter in the social sciences, one quarter in a special branch of business, and one quarter in related business subjects. Since periods of probation and apprenticeship are inherent in the nature of positions at the administrative level, the Northeastern programs based on the Co-operative Plan of Education are especially significant.

Aims

In keeping with the current trends in collegiate education, the educational policy of the College has the following aims:

First: To develop attitudes and ideals that are ethically sound and socially desirable.

Second: To develop the habits of accurate thinking that are essential to sound judgment.

Third: To provide a thorough knowledge of fundamental economic laws and an appreciation of the cultural and social foundations of western civilization.

Fourth: To build breadth of perspective and provide sufficient specialization to meet basic professional requirements.

Fifth: To offer a college program which will help students select the field of business activity best suited to their aptitudes. The Co-operative Plan is particularly effective in this respect.

Methods of Instruction

In the accomplishment of these aims, the College makes use of the lecture and recitation systems and the problem and case methods of instruction.

Introductory and basic tool courses are, for the most part, presented on a lecture-problem basis. A large proportion of the classwork of the upper-class years consists of discussion, analysis, and reports on specific business problems and cases.

Students are encouraged to analyze propositions, to challenge unsupported assertions, to think independently, and to support their thinking with logic and facts. Frequent verbal and written reports are required.

Admission Requirements

Preferred as applicants to the College of Business Administration are those students who are graduates of college preparatory programs of study. Other applicants may be admitted on the recommendation of their principals and guidance officers. The following subjects are, generally, prescribed as entrance requirements:

Subject	Units
English (4 years)	3
Mathematics	1
Science	1
Other college preparatory subjects	6
Electives, not more than	4
	15

GRADUATION REQUIREMENTS

Students may qualify for the degree of Bachelor of Science in Business Administration in one of the following areas of concentration: accounting, economics, finance and insurance, industrial relations, management, and marketing.

Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum in which they seek to qualify. Students who undertake co-operative work assignments must also meet the requirements of the Department of Co-operative Education before they become eligible for their degrees.

Students transferring from another college or university are not eligible to receive the Bachelor of Science degree until they have completed at least one academic year at Northeastern immediately preceding their graduation.

Scholarship Requirements

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the designated area of concentration. An over-all average grade of C is required for graduation.

Graduation with Honor

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least three years before they may become eligible for honors at graduation.

SPECIAL PROGRAM OPPORTUNITIES

Several special program opportunities are available to qualified upperclassmen.

Modern Language Option

During the junior and senior years, eligible students may be permitted to take a one- or two-year sequence of courses in a modern foreign language.

Mathematics and Statistics Options

All students in the college are required to take one year of Business Statistics. Supplementing this requirement, the following courses in Mathematics and Statistics are offered as electives for eligible students during the upperclass years:

1. Three-course sequence in the Fundamentals of Mathematics.

2. Two-course sequence in Mathematics for Statistics.

3. Two-course sequence in Statistical Methods.

Honors Reading Program

This program is designed to encourage the students of the College to exploit their capacity and opportunity for continued self-reliant reading and thinking. Eligible students may participate during their middler, junior, and senior years. During each year a series of informal seminars will be conducted on the readings covered by the participating students.

Thesis Option

Theses are not required of candidates for the degree of Bachelor of Science in Business Administration. Students who show special aptitude for thesis work, however, may be permitted to substitute an appropriate thesis for equivalent work in class. Such permission must be obtained by the candidate from the Dean of the College.

THE PROGRAMS OF STUDY

First Year

The thirty weeks of the freshman year are primarily devoted to a survey of the economic and social institutions that underlie the conduct of business. In addition, accounting and English are given important positions in the program of this first year because of their fundamental significance as tools of communication for the businessman.

Other courses are provided to enrich the student's background in such fields as the physical sciences and the cultural foundations of our civilization.

In addition to regularly scheduled orientation meetings with the Dean of Freshmen, throughout the freshman year each student has the friendly counsel and guidance of a faculty adviser whose aim is to help bridge the gap between high school and college.

Upper-Class Years

Under the Northeastern five-year Co-operative Plan, the alternation of work and classroom study starts with the second year. During this year all students continue with a common program, a major portion of which is devoted to courses which are introductory to the functional areas of business operation.

At the end of the second year, at the close of Term 6, students formally elect their areas of concentration in accordance with their individual interests and aptitudes. To help make this choice a student may obtain professional advice in Northeastern's Testing and Counseling Center.

During the remaining three years, specific required courses are taken in the area of concentration elected by each student in addition to a common core of course work in the liberal arts and general business.

Areas of Concentration

Students are required to select an area of concentration before the end of their sophomore year. A brief statement of the nature of the vocational opportunities in the various fields is presented below. It is well for the prospective student to observe that employment after graduation and success in the business world are seldom determined solely by the student's chosen area of concentration.

I. **Accounting** — Accounting is the second largest field of professional employment. Accountants may specialize in such areas as auditing, tax work, cost accounting, budgeting and control, systems and procedures, agents, investigations, bank examiners, and management services.

Leaders of institutions — business commerce and industry; state, local and national governments; bureaus and agencies; schools, churches, hospitals and foundations — all rely on data accumulated and prepared by accountants

when making decisions which vitally affect the destinies of their institutions. New techniques such as electronic data processing machines are being used for the more effective collection and use of accounting data.

II. Economics — This area of concentration offers a broad approach to the operations of our economic system and of other systems. Job opportunities, therefore, range from industrial economist in the business sphere to specialized economist in the international sphere. Federal, state, and local governments offer many opportunities.

III. Finance and Insurance — Students interested in careers in the areas of security analysis, estate planning, corporate finance and control, security or insurance brokerage, underwriting, credit, banking, etc., select the finance and insurance area. There is a wide variety of vocational opportunities in business, financial institutions, and governmental agencies.

IV. Industrial Relations — Opportunities exist in the field of labor-management relations for those who are qualified. Both unions and management offer positions in personnel, bargaining, wage administration, and public relations. The Government, too, has openings for men and women who are trained in this field.

V. Management — This area of concentration appeals to the student who is more interested in preparation for general business administration and operation rather than any of the more specialized areas of concentration. Positions are available to graduates of this program in commercial, manufacturing, and service businesses. Production planning and control, industrial purchasing and sales, cost control, methods analysis, time study, industrial safety, personnel management, self-employment, and many other vocational opportunities are available.

VI. Marketing — Successful marketing and sales growth have of necessity become key functions of business pervading all aspects of business management.

Because sales success is so vital to every company, opportunities for careers in marketing exist in every type of business and industry — large or small; in manufacturing as well as retailing; in both consumer and industrial products; in advertising, sales, or research; in marketing management, merchandising, or promotion.

ACCOUNTING

FIRST YEAR

TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
20.01	Ec. Geog.	3	3	20.02	Ec. Geog.	3	3	20.04	Intro. to Ec.	3	3
17.01	Surv. Phys. Sci.	3	3	17.02	Surv. Phys. Sci.	3	3	17.03	Surv. Phys. Sci.	3	3
41.01	Prin. of Acct.	2(2)	3	41.02	Prin. of Acct.	2(2)	3	41.03	Prin. of Acct.	2(2)	3
27.21	Found. West. Culture	4	4	27.22	Found. West. Culture	4	4	27.23	Found. West. Culture	4	4
16.10	Phys. Ed or			16.11	Phys. Ed. or			16.12	Phys. Ed. or		
61.01	ROTC (Basic)			61.02	ROTC (Basic)			61.03	ROTC (Basic)		
		15(2)	**16**			**15(2)**	**16**			**15(2)**	**16**

SECOND YEAR

TERM 4*				TERM 5				TERM 6		
30.04	Intro. to Lit.	5	2½	41.24	Manag. Acct.	3	3	41.27	Acct. State.	3	3
17.04a	Surv. Phys. Sci.	5	2½	44.20	Intro. to Fin.	3	3	44.22	Prin. of Risk & Ins.	3	3
27.24	Found. West. Culture	5	2½	45.21	Prin. of Bus. Mgt.	3	3	45.22	Prin. of Bus. Mgt.	3	3
				43.23	Marketing	3	3	43.24	Marketing	3	3
				25.01	Intro. Psych.	4	4	25.02	Gen. Psych.	4	4
		15	**7½**			**16**	**16**			**16**	**16**

THIRD YEAR

TERM 7*				TERM 8				TERM 9		
20.13	Ec. Prin.	8	4	20.37	Ec. Prin.	3	3	20.38	Ec. Prin.	3	3
36.63	Amer. Society or	8	4	20.20	Statistics	4	4	20.21	Statistics	4	4
14.41	Fund. of Math.	8	4	29.01	Pub. Speak.	3	3	29.02	Pub. Speak.	3	3
				41.37	Inter. Acct.	3	3	41.32	Cost Acct.	3	3
				41.31.	Cost Acct.	3	3	41.38	Inter. Acct.	3	3
		16	**8**			**16**	**16**			**16**	**16**

FOURTH YEAR

TERM 10*				TERM 11				TERM 12		
24.40s	El. of Phil.	5	2½	20.18	Am. Ec. Hist.	4	4	46.42	Leg. Asp. of Bus.	3	3
	Elective	5	2½	41.45	Adv. Acct.	3	3	30.15	Literature	3	3
	Elective	5	2½	41.47	Consol. State.	3	3	41.55	Adv. Acct.	3	3
				44.31	Bus. Fin.	4	4	41.56	Acct. in Deci-sion-Making	3	3
				46.41	Leg. Asp. of Bus.	3	3	44.32	Bus. Fin.	4	4
		15	**7½**			**17**	**17**			**16**	**16**

FIFTH YEAR

TERM 13*				TERM 14				TERM 15		
24.41s	Prob. of Phil.	5	2½	20.40	Bus. & Govt.	4	4	20.28	Ec. Systems or	4	4
	Elective	5	2½	46.57	Law of Corp. Fin. & Ins. or	4	4	20.66	Stat. Meth.	4	4
	Elective	5	2½	20.65	Stat. Meth.	4	4	46.54	Basic Fed. Taxes	3	3
				46.53	Basic Fed. Taxes	3	3	41.44	Auditing	3	3
				41.43	Auditing	3	3	41.62	Sem. in Acct.	2	2
				41.61	Sem. in Acct.	2	2	30.48	Mod. Drama	4	4
				50.10	Place. Tech.	1	1				
		15	**7½**			**17**	**17**			**16**	**16**

*Summer term—5 weeks.   ( ) indicate laboratory hours.

ECONOMICS

FIRST YEAR

TERM 1				TERM 2				TERM 3		
No. Course	Cl.	Cr.	No. Course	Cl.	Cr.	No. Course	Cl.	Cr.
30.01 English	3	3	30.02 English	3	3	30.03 English	3	3
20.01 Ec. Geog.	3	3	20.02 Ec. Geog.	3	3	20.04 Intro. to Ec.	3	3
17.01 Surv. Phys. Sci.	3	3	17.02 Surv. Phys. Sci.	3	3	17.03 Surv. Phys. Sci.	3	3
41.01 Prin. of Acct.	2(2)	3	41.02 Prin. of Acct.	2(2)	3	41.03 Prin. of Acct.	2(2)	3
27.21 Found. West. Culture	4	4	27.22 Found. West. Culture	4	4	27.23 Found. West. Culture	4	4
16.10 Phys. Ed. or			16.11 Phys. Ed. or			16.12 Phys. Ed. or		
61.01 ROTC (Basic)			61.02 ROTC (Basic)			61.03 ROTC (Basic)		
	15(2)	16		15(2)	16		15(2)	16

SECOND YEAR

TERM 4*				TERM 5				TERM 6		
30.04 Intro. to Lit.	5	2½	41.24 Manag. Acct.	3	3	41.27 Acct. State.	3	3
17.04a Surv. Phys. Sci.	5	2½	44.20 Intro. to Fin.	3	3	44.22 Prin. of Ins.	3	3
27.24 Found. West. Culture	5	2½	45.21 Prin. of Bus. Mgt.	3	3	45.22 Prin. of Bus. Mgt.	3	3
			43.23 Marketing I	3	3	43.24 Marketing II	3	3
			25.01 Intro. Psych.	4	4	25.02 Gen. Psych.	4	4
	15	7½		16	16		16	16

THIRD YEAR

TERM 7				TERM 8				TERM 9		
14.41 Fund. of Math.	8	4	20.06 Prin. of Ec.	4	4	20.07 Prin. of Ec.	4	4
Elective	8	4	29.01 Pub. Speak.	3	3	29.02 Pub. Speak.	3	3
			44.31 Bus. Fin.	4	4	44.32 Bus. Fin.	4	4
			45.36 Pers. Mgt.	3	3	45.37 Pers. Mgt.	3	3
			22.04 Mod. Democ.	3	3	22.05 Mod. Democ.	3	3
	16	8		17	17		17	17

FOURTH YEAR

TERM 10				TERM 11				TERM 12		
14.42 Math.	5	2½	20.20 Statistics	4	4	20.21 Statistics	4	4
41.33 Cost for Mgmt.	5	2½	20.18 Am. Ec. Hist.	4	4	23.52 Contemp. Eur.	3	3
Elective	5	2½	46.41 Bus. Law	3	3	46.42 Bus. Law	3	3
			24.40 El. of Phil.	3	3	24.42 Prob. of Phil.	3	3
			Elective	3	3	Elective	3	3
	15	7½		17	17		16	16

FIFTH YEAR

TERM 13				TERM 14				TERM 15		
14.43 Math.	5	2½	20.29 Inter. Ec.	4	4	20.30 Inter. Ec.	4	4
41.42 Budget Proced.	5	2½	20.40 Govt. & Bus.	4	4	20.28 Ec. Systems	4	4
Elective	5	2½	20.24 Money & Banking	4	4	30.48 Modern Drama or	4	4
			30.47 Modern Novel or	4	4	20.66 Stat. Meth.	4	4
			20.65 Stat. Meth.	4	4	Ec. Elective	4	4
			50.10 Place. Tech.	1	1			
	15	7½		17	17		16	16

*Summer term—5 weeks.   ( ) indicate laboratory hours.

FINANCE AND INSURANCE

FIRST YEAR

TERM 1				TERM 2				TERM 3		
No. Course	Cl.	Cr.		No. Course	Cl.	Cr.		No. Course	Cl.	Cr.
30.01 English	3	3		30.02 English	3	3		30.03 English	3	3
20.01 Ec. Geog.	3	3		20.02 Ec. Geog.	3	3		20.04 Intro. to Ec.	3	3
17.01 Surv. Phys. Sci.	3	3		17.02 Surv. Phys. Sci.	3	3		17.03 Surv. Phys. Sci.	3	3
41.01 Prin. of Acct.	2(2)	3		41.02 Prin. of Acct.	2(2)	3		41.03 Prin. of Acct.	2(2)	3
27.21 Found. West. Culture	4	4		27.22 Found. West. Culture	4	4		27.23 Found. West. Culture	4	4
16.10 Phys. Ed. or 61.01 ROTC (Basic)				16.11 Phys. Ed. or 61.02 ROTC (Basic)				16.12 Phys. Ed. or 61.03 ROTC (Basic)		
	15(2)	16			15(2)	16			15(2)	16

SECOND YEAR

TERM 4*				TERM 5				TERM 6		
30.04 Intro. to Lit.	5	2½		41.24 Manag. Acct.	3	3		41.27 Acct. State.	3	3
17.04a Surv. Phys. Sci.	5	2½		44.20 Intro. to Fin.	3	3		44.22 Prin. of Risk & Ins.	3	3
27.24 Found. West. Culture	5	2½		45.21 Prin. of Bus. Mgt.	3	3		45.22 Prin. of Bus. Mgt.	3	3
				43.23 Marketing	3	3		43.24 Marketing	3	3
				25.01 Intro. Psych.	4	4		25.02 Gen. Psych.	4	4
	15	7½			16	16			16	16

THIRD YEAR

TERM 7*				TERM 8				TERM 9		
20.13 Ec. Prin.	8	4		20.37 Ec. Prin.	3	3		20.38 Ec. Prin.	3	3
14.41 Fund. of Math.	8	4		20.20 Statistics	4	4		20.21 Statistics	4	4
				44.31 Bus. Fin.	4	4		29.02 Pub. Speak.	3	3
				44.33 Life Ins.	3	3		44.32 Bus. Fin.	4	4
				29.01 Pub. Speak.	3	3		44.34 Prop. & Cas. Ins.	3	3
	16	8			17	17			17	17

FOURTH YEAR

TERM 10*				TERM 11				TERM 12		
24.40s El. of Phil.	5	2½		20.18 Am. Ec. Hist.	4	4		20.51a Pub. Fin.	3	3
Elective	5	2½		44.35 Est. Tax.	3	3		44.36 Est. Tax.	3	3
Elective	5	2½		44.41 Investments	3	3		30.15 Literature	3	3
				46.41 Leg. Asp. of Bus.	3	3		44.42 Investments	3	3
				20.24a Money & Bank.	3	3		46.42 Leg. Asp. of Bus.	3	3
	15	7½			16	16			15	15

FIFTH YEAR

TERM 13*				TERM 14				TERM 15		
24.41s Prob. of Phil.	5	2½		20.40 Bus. & Govt.	4	4		20.28 Ec. Systems	4	4
Elective	5	2½		23.52 Contem. Eur.	3	3		or		
Elective	5	2½		44.52 Sec. Mkts.	3	3		20.66 Stat. Meth.	4	4
				46.57 Law of Corp. Fin. & Ins.	4	4		44.62 Sem. in Fin. & Ins.	4	4
				or				20.25 Bus. Cycles	4	4
				20.65 Stat. Meth.	4	4		30.48 Mod. Drama	4	4
				44.61 Seminar	2	2				
				50.10 Place. Tech.	1	1				
	15	7½			17	17			16	16

*Summer term—5 weeks.   ( ) indicate laboratory hours.

INDUSTRIAL RELATIONS

FIRST YEAR

TERM 1			TERM 2			TERM 3		
No. Course	Cl.	Cr.	No. Course	Cl.	Cr.	No. Course	Cl.	Cr.
30.01 English	3	3	30.02 English	3	3	30.03 English	3	3
20.01 Ec. Geog.	3	3	20.02 Ec. Geog.	3	3	20.04 Intro. to Ec.	3	3
17.01 Surv. Phys. Sci.	3	3	17.02 Surv. Phys. Sci.	3	3	17.03 Surv. Phys. Sci.	3	3
41.01 Prin. of Acct.	2(2)	3	41.02 Prin. of Acct.	2(2)	3	41.03 Prin. of Acct.	2(2)	3
27.21 Found. West. Culture	4	4	27.22 Found. West. Culture	4	4	27.23 Found. West. Culture	4	4
16.10 Phys. Ed. or			16.11 Phys. Ed. or			16.12 Phys. Ed. or		
61.01 ROTC (Basic)			61.02 ROTC (Basic)			61.03 ROTC (Basic)		
	15(2)	**16**		**15(2)**	**16**		**15(2)**	**16**

SECOND YEAR

TERM 4*			TERM 5			TERM 6		
30.04 Intro. to Lit.	5	2½	41.24 Manag. Acct.	3	3	41.27 Acct. State.	3	3
17.04a Surv. Phys. Sci.	5	2½	44.20 Intro. to Fin.	3	3	44.22 Prin. of Risk & Ins.	3	3
27.24 Found. West. Culture	5	2½	45.21 Prin. of Bus. Mgt.	3	3	45.22 Prin. of Bus. Mgt.	3	3
			43.23 Marketing	3	3	43.24 Marketing	3	3
			25.01 Intro. Psych.	4	4	25.02 Gen. Psych.	4	4
	15	**7½**		**16**	**16**		**16**	**16**

THIRD YEAR

TERM 7*			TERM 8			TERM 9		
20.13 Ec. Prin.	8	4	20.20 Statistics	4	4	20.21 Statistics	4	4
36.63 Amer. Society or	8	4	20.37 Ec. Prin.	3	3	20.38 Ec. Prin.	3	3
14.41 Fund. of Math.	8	4	20.26 Labor Ec. or	3	3	20.26 Labor Ec. or	3	3
			25.35a Ind. Psych.			25.35a Ind. Psych.		
			29.01 Pub. Speak.	3	3	29.02 Pub. Speak.	3	3
			44.31 Bus. Fin.	4	4	44.32 Bus. Fin.	4	4
	16	**8**		**17**	**17**		**17**	**17**

FOURTH YEAR

TERM 10*			TERM 11			TERM 12		
41.43 Cost for Mgt.	5	2½	45.36 Pers. Mgt.	3	3	45.37 Pers. Mgt.	3	3
Elective	5	2½	45.41 Prod. Mgt.	3	3	45.42 Prod. Mgt.	3	3
Elective	5	2½	46.41 Leg. Asp. of Bus.	3	3	46.42 Leg. Asp. of Bus.	3	3
			20.18 Am. Ec. Hist.	4	4	23.52 Contemp. Eur.	3	3
			24.40 El. of Phil.	3	3	24.41 Prob. of Phil.	3	3
	15	**7½**		**16**	**16**		**15**	**15**

FIFTH YEAR

TERM 13*			TERM 14			TERM 15		
41.42 Budget Proc.	5	2½	20.40 Bus. & Govt.	4	4	20.28 Ec. Systems	4	4
Elective	5	2½	46.55 Labor Law	3	3	or		
Elective	5	2½	42.52 Mot. & Time	1(2)	2	20.66 Stat. Meth.	4	4
			45.61 Sem. in Mgt.	3	3	36.25 Urban Soc.	4	4
			30.47 Mod. Novel or	4	4	42.62 Sem. Coll. Barg.	4	4
			20.65 Stat. Meth.	4	4	20.25 Bus. Cycles	4	4
			50.10 Place. Tech.	1	1			
	15	**7½**		**16(2)**	**17**		**16**	**16**

*Summer term—5 weeks.   ( ) indicate laboratory hours.

MANAGEMENT

FIRST YEAR

TERM 1			TERM 2			TERM 3		
No.	Course	Cl. Cr.	No.	Course	Cl. Cr.	No.	Course	Cl. Cr.
30.01	English	3 3	30.02	English	3 3	30.03	English	3 3
20.01	Ec. Geog.	3 3	20.02	Ec. Geog.	3 3	20.04	Intro. to Ec.	3 3
17.01	Surv. Phys. Sci.	3 3	17.02	Surv. Phys. Sci.	3 3	17.03	Surv. Phys. Sci.	3 3
41.01	Prin. of Acct.	2(2) 3	41.02	Prin. of Acct.	2(2) 3	41.03	Prin. of Acct.	2(2) 3
27.21	Found. West. Culture	4 4	27.22	Found. West. Culture	4 4	27.23.	Found. West. Culture	4 4
16.10	Phys. Ed. or		16.11	Phys. Ed. or		16.12	Phys. Ed. or	
61.01	ROTC (Basic)		61.02	ROTC (Basic)		61.03	ROTC (Basic)	
		15(2) 16			**15(2) 16**			**15(2) 16**

SECOND YEAR

TERM 4*			TERM 5			TERM 6		
30.04	Intro. to Lit.	5 2½	41.24	Manag. Acct.	3 3	41.27	Acct. State.	3 3
17.04a	Surv. Phys. Sci.	5 2½	44.20	Intro. to Fin.	3 3	44.22	Prin. of Risk & Ins.	3 3
27.24	Found. West. Culture	5 2½	45.21	Prin. of Bus. Mgt.	3 3	45.22	Prin. of Bus. Mgt.	3 3
			43.23	Marketing	3 3	43.24	Marketing	3 3
			25.01	Intro. Psych.	4 4	25.02	Gen. Psych.	4 4
		15 7½			**16 16**			**16 16**

THIRD YEAR

TERM 7*			TERM 8			TERM 9		
20.13	Ec. Prin.	8 4	20.20	Statistics	4 4	20.21	Statistics	4 4
36.63	Amer. Society or	8 4	20.37	Ec. Prin.	3 3	20.38	Ec. Prin.	3 3
14.41	Fund. of Math.	8 4	20.26	Labor Ec. or	3 3	20.26	Labor Ec. or	3 3
			25.35a	Ind. Psych.		25.35a	Ind. Psych.	
			29.01	Pub. Speak.	3 3	29.02	Pub. Speak.	3 3
			44.31	Bus. Fin.	4 4	44.32	Bus. Fin.	4 4
		16 8			**17 17**			**17 17**

FOURTH YEAR

TERM 10*			TERM 11			TERM 12		
41.33	Cost for Mgt.	5 2½	45.36	Pers. Mgt.	3 3	45.37	Pers. Mgt.	3 3
	Elective	5 2½	45.41	Prod. Mgt.	3 3	45.42	Prod. Mgt.	3 3
	Elective	5 2½	46.41	Leg. Asp. of Bus.	3 3	46.42	Leg. Asp. of Bus.	3 3
			20.18	Am. Ec. Hist.	4 4	23.52	Contemp. Eur.	3 3
			24.40	El. of Phil.	3 3	24.41	Prob. of Phil.	3 3
		15 7½			**16 16**			**15 15**

FIFTH YEAR

TERM 13*			TERM 14			TERM 15		
41.42	Budget. Proc.	5 2½	20.40	Bus. & Govt.	4 4	20.28	Ec. Systems	4 4
	Elective	5 2½	43.43	Mktg. Res.	3 3		or	
	Elective	5 2½	45.52	Mgt. of Sales	2 2	20.66	Stat. Meth.	4 4
			45.61	Sem. in Mgt. or	3 3	46.56	Law of Merch.	4 4
			30.47	Mod. Novel	4 4	30.48	Mod. Drama	4 4
			20.65	Stat. Meth.	4 4	45.62	Sem. in Mgt.	4 4
			50.10	Place. Tech.	1 1			
		15 7½			**17 17**			**16 16**

*Summer term—5 weeks.   ( ) indicate laboratory hours.

MARKETING

FIRST YEAR

TERM 1			TERM 2			TERM 3		
No. Course	Cl.	Cr.	No. Course	Cl.	Cr.	No. Course	Cl.	Cr.
30.01 English	3	3	30.02 English	3	3	30.03 English	3	3
20.01 Ec. Geog.	3	3	20.02 Ec. Geog.	3	3	20.04 Intro. to Ec.	3	3
17.01 Surv. Phys. Sci.	3	3	17.02 Surv. Phys. Sci.	3	3	17.03 Surv. Phys. Sci.	3	3
41.01 Prin. of Acct.	2(2)	3	41.02 Prin. of Acct.	2(2)	3	41.03 Prin. of Acct.	2(2)	3
27.21 Found. West. Culture	4	4	27.22 Found. West. Culture	4	4	27.23 Found. West. Culture	4	4
16.10 Phys. Ed. or 61.01 ROTC (Basic)			16.11 Phys. Ed. or 61.02 ROTC (Basic)			16.12 Phys. Ed. or 61.03 ROTC (Basic)		
	15(2)	16		15(2)	16		15(2)	16

SECOND YEAR

TERM 4*			TERM 5			TERM 6		
30.04 Intro. to Lit.	5	2½	41.24 Manag. Acct.	3	3	41.27 Acct. State.	3	3
17.04a Surv. Phys. Sci.	5	2½	44.20 Intro. to Fin.	3	3	44.22 Prin. of Risk & Ins.	3	3
27.24 Found. West. Culture	5	2½	45.21 Prin. of Bus. Mgt.	3	3	45.22 Prin. of Bus. Mgt.	3	3
			43.23 Marketing	3	3	43.24 Marketing	3	3
			25.01 Intro. Psych.	4	4	25.02 Gen. Psych.	4	4
	15	7½		16	16		16	16

THIRD YEAR

TERM 7*			TERM 8			TERM 9		
20.13 Ec. Prin.	8	4	30.37 Ec. Prin.	3	3	20.38 Ec. Prin.	3	3
36.63 Amer. Society or 14.41 Fund. of Math.	8	4	29.01 Pub. Speak.	3	3	29.02 Pub. Speak.	3	3
	8	4	43.35 Marketing Mgt.	3	3	43.36 Marketing Mgt.	3	3
			43.37 Sales Mgt.	3	3	43.40 Advtg. Prod.	3	3
			44.31 Bus. Fin.	4	4	44.32 Bus. Fin.	4	4
	16	8		16	16		16	16

FOURTH YEAR

TERM 10*			TERM 11			TERM 12		
24.40s El. of Phil.	5	2½	20.20 Statistics	4	4	20.21 Statistics	4	4
Elective	5	2½	20.18 Am. Ec. Hist.	4	4	43.46 Int. Mktg.	3	3
Elective	5	2½	46.41 Leg. Asp. of Bus.	3	3	46.42 Leg. Asp. of Bus.	3	3
			43.42 Mktg. Policy	3	3	30.15 Literature	3	3
			43.43 Mktg. Res.	3	3	43.45 Mktg. Res.	3	3
	15	7½		17	17		16	16

FIFTH YEAR

TERM 13*			TERM 14			TERM 15		
24.41s Prob. of Phil.	5	2½	20.40 Bus. & Govt.	4	4	20.28 Ec. Systems	4	4
Elective	5	2½	43.50 Ind. Mktg.	2	2	or		
Elective	5	2½	43.52 Ret. Merch.	3	3	20.66 Stat. Meth.	4	4
			30.47 Mod. Novel	4	4	46.56 Law of Merch.	4	4
			or			43.60 Mktg. Controls	4	4
			20.65 Stat. Meth.	4	4	43.62 Sem. in Mktg. Theory	4	4
			23.52 Contemp. Eur.	3	3			
			50.10 Place. Tech.	1	1			
	15	7½		17	17		16	16

*Summer term—5 weeks.   ( ) indicate laboratory hours.

College of Pharmacy

Dr. LeRoy C. Keagle, Dean
Dr. Russell E. Brillhart, Assistant Dean

ADVISORY COUNCIL

David T. Scott
Chairman

George F. Baughman
Charles A. Berman
John E. F. Cusick
John Griffin
David D. Haig
Peter J. Jordan
Edward A. Loring
Constantine N. Meriano
Leavitt C. Parsons
Charles L. Quinn
Gerald Stepner

Aims

NORTHEASTERN UNIVERSITY recognizes the great need for well-educated pharmacists. The College of Pharmacy is pledged to help meet this need through its program of academic and co-operative work and extracurricular activities, all of which are designed to prepare students effectively to become professional practitioners, to enter graduate schools, and to accept employment in the several branches of the pharmaceutical field.

In order to fulfill these aims special emphasis is placed upon the three pillars of a sound pharmacy education — teaching, research, and service. This goal necessitates closely integrated instruction in all of the pharmacy disciplines and its related areas, such as liberal arts, the humanities, and the basic sciences.

A new physical plant has been developed to facilitate these objectives, and additions to the pharmacy faculty are scholars who combine research and teaching as part of their regular commitment to the University.

It is intended that the academic, scientific, and professional environment created by the faculty and facilities will promote an atmosphere of inquiry and a healthy dissatisfaction for mediocrity.

The College will prepare its graduates to assume most effectively the intellectual, legal, civic, and moral responsibilities associated with the profession of pharmacy.

Since the professional standing of pharmacy is dependent upon those who are associated with it, the College seeks to enroll only those whose aptitudes, character, and attitudes are compatible with the profession and its goals.

Once a student has been accepted, the College endeavors to develop in the individual well-balanced personal qualities to meet these requirements.

The curriculum is designed to meet the needs of modern pharmacy in both theoretical and applied aspects, which will permit the graduate to enter the various fields of pharmacy. There is continuous search and experimentation for new and improved methods of teaching and subject material to be presented.

The Future of Pharmacy

Pharmacy has grown far beyond the popular concept of the profession. To many the term "pharmacist" suggests a white-clad, somewhat mysteriously efficient dispenser of medicine in a neighborhood drugstore. It is true that among the 116,757 pharmacists practicing in America today approximately 100,000 work in retail pharmacies.

A good number of pharmacists, however, are employed in other rapidly growing branches of the profession. One of the fastest growing branches is hospital pharmacy, and another is industrial pharmacy. Some pharmacists find careers in the Armed Forces, government agencies, professional associations, and colleges.

Pharmacy is not restricted to men. Women now make up 12 per cent of the enrollment in pharmacy colleges, with the number increasing yearly. They comprise nearly 7 per cent of all practicing pharmacists and 33 per cent of the hospital pharmacists.

Several major trends in our national life assure further expansion of the pharmaceutical profession in the years ahead. Within our growing population, the average life span has increased to 67 years for men and 73 for women. Maintaining high standards of health for this enlarged population demands more well-educated pharmacists.

These same medical and pharmaceutical advances which contribute to a longer life span also expand the areas for research and the opportunity for improving existing drugs.

It is unnecessary to dwell on the tremendous increase in college applicants expected during the next decade. The need for trained men and women in the health professions indicates that colleges of pharmacy can expect to enroll a fair portion of the expanding student population.

Certainly the present enrollment in the nation's 76 accredited colleges of pharmacy is not adequate to meet the needs of the future.

Admission Requirements

Applicants for admission to the freshman class must earn the recommendation of their principals or guidance counselors for the particular program to which they have applied. The most important single factor among the credentials submitted to the Committee on Admissions is the candidate's record of achievement in high school or preparatory school.

All applicants to the freshman class of the College of Pharmacy must present the following subject-matter units:

Subject	Units
English (4 years)	3
Mathematics	3
Sciences (Biology and Chemistry preferred)	2
Other college preparatory subjects	5
Electives, not more than	2
	15

Transfer with Advanced Standing

The Northeastern University College of Pharmacy welcomes transfer students who have successfully completed one or two years of preprofessional study in an accredited institution of college grade. A candidate for advanced standing should:

1. Have had courses which enable him to enter at the beginning of the second or third year and thereafter continue as a regular student.

2. Have earned average grades or better in his previous college work. (No credit is given for the lowest passing mark.)

Transfer students are admitted only in September to the College of Pharmacy.

GRADUATION REQUIREMENTS

Quantitative Requirements

Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum. The curriculum for the first three years of the five-year program is listed on page 136.

Students who undertake co-operative work assignments must meet the requirements of the Department of Co-operative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until at least one year of academic work immediately preceding graduation has been completed at Northeastern.

Qualitative Requirements

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the field of specialization. Students will be expected to maintain an over-all average of C. Those who are clearly unable to meet the accepted standard of attainment will be required to withdraw from the University.

Graduation with Honor

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University for at least three years before they become eligible for honors at graduation.

Licensure

Licensure may be obtained after graduation by passing the examination requirements established by the Massachusetts State Board of Pharmacy or those of other states.

Accreditation

The College of Pharmacy is accredited by the American Council on Pharmaceutical Education and is a member of the American Association of Colleges of Pharmacy.

The Pharmacy Curriculum

Students enrolled and in good standing in the New England College of Pharmacy as of September 1, 1962, were transferred to the College of Pharmacy at Northeastern when the University acquired control. The projected curriculum for students in the Class of 1966 is shown below.

Description of the courses in the curricula will be found in the catalog section entitled "Courses of Instruction." Detailed descriptions are given only for those courses which will be offered during the academic year 1964-1965.

TRANSITIONAL CURRICULUM IN PHARMACY

Class of 1966

FOURTH YEAR

TERM 8			TERM 9			TERM 10*		
71.11 Adv. Pharm.	3(3)	4	71.12 Dispens. Pharm.	3(3)	4	Lib. Elect.	8	4
72.05 Org. Med.	3	3	72.06 Org. Med.	3	3	Lib. Elect.	8	4
72.02 Drug Anal.	3(3)	4	73.07t Ph'cology	3(3)	4			
73.05 Biochemistry	3(3)	4	73.06 Biochemistry	3(3)	4			
73.07 Ph'cology	2	2	75.01 Drug Mktg.	3	3			
	14(9)	**17**		**15(9)**	**18**		**16**	**8**

FIFTH YEAR

TERM 11			TERM 12			TERM 13*		
71.13 Dispens. Pharm.	3(3)	4	71.14 Dispens. Pharm.	3(3)	4	71.14t Dispens. Pharm.	3(3)	2
73.08 Ph'cology	3(3)	4	73.09 Ph'cology	2(3)	3	73.09t Ph'cology	4	2
72.06t Org. Med.	2	2	74.05 Pub. Health	2	2	74.05t Pub. Health	4	2
73.10 Rad. Biol.	2(3)	3	75.03 Retail Pharm. Mgt.	3	3	75.04t Jurisprudence	4	2
75.02 Retail Pharm. Mgt.	3	3	75.04 Jurisprudence	2	2			
50.20 Place. Tech.	2	1	46.59 Bus. Law	3	3			
	15(9)	**17**		**15(6)**	**17**		**15(3)**	**8**

*Summer term—5 weeks.   ( ) indicate laboratory hours.

CLASSES ON THE NEW CURRICULUM

PHARMACY

Class of 1969
FIRST YEAR

TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
10.01	Gen. Biol.	2(3)	3	10.02	Gen. Biol.	2(3)	3	10.03	Gen. Biol.	2(3)	3
11.46	Gen. Chem.	3(3)	4	11.47	Gen. Chem.	3(3)	4	11.48	Gen. Chem.	3(6)	5
14.21	Basic Math.	3	3	14.22	Basic Math.	3	3	14.23	Basic Math.	3	3
71.71	Intro. Pharm.	1	0	71.72	Intro. Pharm.	1	0	71.73	Intro. Pharm.	1	0
23.01	West. Civ. or Mod. Lang. Elect.	4 3	4 3	23.02	West. Civ. or Mod. Lang. Elect.	4 3	4 3	23.03	West. Civ. or Mod. Lang. Elect.	4 3	4 3
16.10 61.01	Phys. Ed. or ROTC (Basic)			16.11 61.02	Phys. Ed. or ROTC (Basic)			16.12 61.03	Phys. Ed. or ROTC (Basic)		
		16(6) or 15(6)	17 16			16(6) or 15(6)	17 16			16(9) or 15(9)	18 17

Class of 1968
SECOND YEAR

TERM 4*				TERM 5				TERM 6		
10.04	Gen. Biol.	3(3)	2	11.26	Org. Chem.	3(3)	4	71.01	Pharmacy	4(3)	5
11.49	Gen. Chem.	3(6)	2½	15.11	Gen. Phys.	4	4	11.27	Org. Chem.	3(3)	4
14.24	Basic Math.	5	2½	20.06	Ec. Prin.	4	4	20.07	Ec. Prin.	4	4
23.04	West. Civ. or Mod. Lang. Elect.	4 3	2 1½	41.11	Accounting Elective	2 4	2 4	41.12	Accounting Elective	2 4	2 4
		15(9) or 14(9)	9 8½			17(3)	18			17(6)	19

Class of 1967
THIRD YEAR

TERM 7*				TERM 8				TERM 9		
10.32	Human Anat.	5(6)	3½	71.02	Pharmacy	4(3)	5	11.17	Quant. Anal.	3(3)	4
30.04	Intro. to Lit.	5	2½	11.28	Org. Chem.	4(3)	5	72.01	Inorg. Med.	4	4
29.03	Pub. Speak.	6	3	15.12	Gen. Phys.	3(3)	5	15.13	Gen. Phys.	3(3)	5
				10.40	Physiology	3(3)	4	10.41	Physiology	3(3)	4
		16(6)	9			14(12)	19			13(9)	17

*Summer term—5 weeks.   ( ) indicate laboratory hours.

College of Nursing

Dr. Charlotte E. Voss, Dean

Purpose and Plan of the College

The College of Nursing prepares students for beginning service as staff nurses and lays the foundation for future professional development. Its educational program is three years in length, prepares for the R.N. Examinations, and leads to the degree of Associate in Science.

This associate degree curriculum in nursing is designed for students of good ability who rank no lower than the middle of their high school classes, who complete the conventional requirements for admission to college, and who are strongly motivated toward nursing as a vocation, but who, for one reason or another, do not wish to undertake a baccalaureate program. These young women want to prepare themselves to be registered nurses as quickly as possible, and often they need help in financing their professional education.

Courses of instruction are fashioned particularly to meet the needs of students who expect to enter service as staff nurses immediately upon graduation, and who in the main do not plan to continue their formal education beyond the associate degree. All instruction is at the college level, but all courses are not identical in content with those given in the first two years of a curriculum leading to the Bachelor of Science degree. Thus the courses in science include the subject matter upon which nursing applications are based, as is appropriate in sound technical education.

Some of the abler students who complete the associate degree program may be inspired to continue toward higher degrees. If the demand is sufficient, Northeastern plans to establish a further program in nursing through which these students can qualify for the bachelor's degree with a minimum loss of time.

Educational Method

In common with the other Basic Colleges at Northeastern, curricula of the College of Nursing will be distinctive in that they will operate on the Co-operative Plan which the University has long applied to technical and professional curricula in many fields. Each student will have 46 weeks of practical experience as a paid employee of one of the collaborating hospitals (Beth Israel, Children's Hospital Medical Center, or Massachusetts General) in addition to the 80 weeks of college instruction. The co-operative work does not carry academic credit, but successful completion of this phase of the program is an integral part of the requirements for the associate degree.

During their periods of employment, students will have an opportunity to increase their nursing skills and to earn a major part of their expenses. At current rates the students earn about $1400 during each of the second and third years. It should be noted that this co-operative feature is supplementary to the academic program and does not take the place of any academic or clinical course work normally required in preparation for the R.N. Examinations and the associate degree.

Co-operative students will begin their work at Beth Israel, Children's, or Massachusetts General Hospital. Their duties will increase in scope and in responsibility as the students demonstrate competence to assist the professional nursing staff. Care will be exercised also to see that students are not given co-operative assignments for which they are inadequately prepared.

The first year of the associate degree program comprises 35 weeks of continuous full-time study at the University with formal instruction in nursing beginning immediately. There are 17 weeks following the freshman year when the students are free for vacation. Those who wish to work may do so either at co-operating hospitals or elsewhere.

Co-operative work begins with the opening of the second year in September, when the students will be divided into two equal groups, Division A and Division B. Division A students attend the University for a ten-week period of instruction while their alternates in Division B are at work in one of the three co-operating hospitals. In mid-November, at the end of the ten-week term, the two groups change places, Division B students returning to the University, where the first ten-week period of instruction will be repeated for them and Division A students taking over the co-operative assignments in the hospitals.

In this manner the two divisions alternate for the remainder of the program, one student being on the job while her alternate is at college or on vacation; and both are graduated together in June of the third year. Second-year students have 25 weeks of college study, 26 weeks of co-operative work, and one week of vacation; third-year students have 20 weeks of college study and 20 weeks of co-operative work.

Admission Requirements

Candidates for admission to the College of Nursing must have been graduated from an accredited secondary school and have the recommendation of the school principal or guidance officer. The following subject-matter credits are required as preparation for the nursing curriculum:

English (4 years)	3 units
Mathematics	3 "
Biology	1 "
Physics or Chemistry	1 "
Other college preparatory subjects	7 "
Total	15 units

Although the most important credential for admission to the College is a good high school record, all candidates are also required to write both the Scholastic Aptitude Test and certain Achievement Tests of the College Entrance Examination Board. The Achievement Tests should include: English Composition, Intermediate Mathematics, and either Biology or Chemistry.

Other factors considered by the Department of Admissions are the general health of the candidate and the degree of interest and motivation she has for the profession of nursing.

GRADUATION REQUIREMENTS

Quantitative Requirements

Candidates for the degree of Associate in Science must successfully complete all of the prescribed courses in the three-year curriculum shown on page 141. They must also carry out effectively the prescribed periods of co-operative work at one or more of the hospitals associated with Northeastern in the program of nursing education.

Students transferring from another college will not be eligible to receive a degree from the College of Nursing until they have completed at least one year of academic work at Northeastern immediately preceding graduation.

Qualitative Requirements

The degree conferred not only represents the formal completion of the curriculum but also indicates competence for beginning service as a professional staff nurse. An over-all scholarship average of at least C is required for graduation.

Graduation with Honor

Candidates whose academic achievement is extraordinary will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or highest honor.

Registration

The program of the College prepares students for the professional examinations established by the Board of Registration in Nursing of the Commonwealth of Massachusetts. Students normally take these examinations for licensure as a professional nurse at the end of their third year near the time of graduation.

NURSING

FIRST YEAR

TERM 1				TERM 2				TERM 3		
No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.	No.	Course	Cl.	Cr.
30.01	English	3	3	30.02	English	3	3	30.03	English	3	3
11.06	Chemistry	2(3)	3	11.07	Chemistry	2(3)	3	11.08	Chemistry	2(3)	3
25.01	Psychology	4	4	25.02	Psychology	4	4	10.40	Physiology	3(3)	4
80.01	Nursing	4(6)	6	10.32	Anatomy	3(3)	4	80.11	Nursing	4(9)	7
16.10	Phys. Ed.	(2)		80.10	Nursing	2(6)	4	16.12	Phys. Ed.	(2)	
				16.11	Phys. Ed.	(2)					
		13(11) 16				**14(14) 18**				**12(17) 17**	

SECOND YEAR

TERM 4*			TERM 5				TERM 6			
80.12 Nursing	8(24)	8	30.15 Literature	3	3		30.16 Literature	3	3	
			10.41 Physiology	3(3)	4		36.02 Sociology	4	4	
			36.01 Anthropology	4	4		10.20 Microbiology	3(3)	4	
			80.13 Nursing	3(9)	6		80.14 Nursing	3(9)	6	
	8(24)	**8**		**13(12) 17**				**13(12) 17**		

THIRD YEAR

TERM 7*			TERM 8				TERM 9			
80.20 or			10.21 Microbiology	3(3)	4		29.03 Eff. Speak.	3	3	
80.30 or			25.21 Child & Adol.				80.50 Trends in			
80.40 Nursing	8(24)	8	Psychology	4	4		Nursing	3	3	
			80.20 or				80.20 or			
			80.30 or				80.30 or			
			80.40 Nursing	4(12)	8		80.40 Nursing	4(12)	8	
							Lib. Elect.	3	3	
	8(24)	**8**		**11(15) 16**				**13(12) 17**		

The curriculum leading to the degree of Associate in Science comprises 134 credit hours (84 semester hours) of academic study and 46 weeks of co-operative work at Beth Israel, Children's, or Massachusetts General Hospital.

*Summer term—5 weeks.   ( ) indicate laboratory hours.

Courses of Instruction

On the pages which follow are given in numerical order the synopses of courses offered in the several curricula of the Basic Colleges. Although not all courses are offered every year, all will be offered during the normal period of each student's curriculum. The term "preparation" indicates a course that must be taken before undertaking the advanced course to which it applies.

Courses in the part-time evening programs in the College of Engineering are identical with those in the full-time day program. For administrative purposes, part-time evening courses in engineering will carry an E after the course number. (Ex. 3-51E Electrical Engineering I)

A credit hour equals approximately three clock hours of work: ordinarily one hour of class and two hours of preparation a week for a term of 10 weeks. Laboratory and drawing courses normally require fewer hours of outside preparation and, therefore, carry less credit than lecture courses. Since the summer terms are only 5 weeks long, courses offered in the summer carry one-half of the credits carried by courses which meet the same number of hours per week in the regular 10-week terms. Credit hours can be converted into standard semester hours by multiplying by 10/16, the ratio of the number of weeks in the term to the usual number of weeks in the semester.

The University reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

ABBREVIATIONS

Prep.	Preparation
Cl.	Class Hours
Lab.	Laboratory Hours
Cr.	Credit Hours

The letter S following a course number signifies a course given during a summer term.

Civil Engineering

1.10 Surveying   3 Cl.; 3 Lab.; 3 Cr.
Basic surveying principles with field applications; theory of measurements and basic survey calculations for traverse.

1.11 Surveying   Prep. 1.10; 4 Cl.; 3 Lab.; 4 Cr.
Horizontal and vertical lines, spiral easement curves, earthwork calculations, basic spherical trigonometry. Laboratory portion consists of curve layouts and complex problem solutions.

1.14 Surveying   Prep. 1.11; 6 Cl.; 6 Lab.; 3 Cr.
Theory and practice for observation on the sun for latitude, time, and azimuth; basic principles of photogrammetry; introduction to the electronic computer methods for survey calculations.

1.20 Hydraulics   Prep. 2.21; 3 Cl.; 3 Cr.
A basic course in hydraulics dealing with the laws of hydrostatics and hydrokinetics.

Topics studied include: gages; manometers; pressure intensities; simple dams; flotation problems; Bernoulli's theorem; the Venturi meter, orifices; short tubes; pipe lines; and open channel flow.

1.21 Hydraulics   Prep. 1.20; 3 Cl.; 3 Cr.
Equivalent pipes; the Hardy Cross method of analysis; weirs; dimensional analysis; model analysis by Froude's number and by Reynold's number; flow of fluids through closed conduits; the hydraulic jump; and the drawdown and backwater curves.

1.24 Sanitary Engineering   Prep. 1.21; 4 Cl.; 4 Cr.
A general course in water supply engineering including: forecasting population; quality and quantity of water; rainfall; runoff; collection and storage of ground water and surface water; sand filters; treatment of waters for the removal of impurities; disinfection of waters; and the distribution system.

1.25 Sanitary Engineering   Prep. 1.24; 3 Cl.; 3 Lab.; 4 Cr.
A companion course to 1-24. Collection and disposal of sewage and storm water; sewerage systems; collection of design data; modern methods of sewage treatment and operation of treatment plants.

Laboratory portion considers handling and analysis of water and sewage.

1.26 Fluid Mechanics   Prep. 2.21, 3.19; 3 Cl.; 3 Cr.
Application of fundamental principles of mechanics to the flow of fluids. The student's prior experience with partial differential equations and vector analysis will be used as a basis for this treatment.

1.30 Transportation   Prep. 1.12; 4 Cl.; 4 Cr.

Engineering considerations in the planning and construction of modern highways. Brief review of the functions of various highway administrative agencies, followed by a consideration of methods of analyzing traffic problems and economic and financial factors in obtaining a solution. Consideration of high speed, high capacity, modern highways. Flexible and rigid pavements are considered, along with current practice in the use of both bituminous material and cement concrete in the construction of modern heavy-duty pavements.

1.40 Structural Analysis   Prep. 2.22; 3 Cl.; 3 Cr.

Determination of reactions, shears, bending moments, and stresses developed by loads upon beams and frame structures.

1.41 Structural Analysis   Prep. 1.40; 4 Cl.; 4 Cr.

Roof loads; girder, simple truss, and subdivided truss, highway and railway bridges; influence lines and their function in determining the shears, bending moments, and stresses produced by moving load systems; discussion of design stresses.

1.42 Structural Analysis   Prep. 1.41; 3 Cl.; 3 Cr.

Slope and deflection of beams and girders due to bending, deflection of statically determinate framed structures.

1.43 Structural Analysis   Prep. 1.42; 4 Cl.; 4 Cr.

Analysis of continuous beams, simple statically indeterminate trusses and frameworks; shears, moments, and stresses developed in tall building frames.

1.48 Structures   Prep. 2.23; 6 Cl.; 3 Cr.

Analysis and design of simple structures with emphasis on structures of special interest to mechanical engineers including: steel mill building frames, trusses, building and crane girders, and columns.

1.49 Concrete Testing Laboratory   Prep. 2.23; 1 Cl.: 4 Lab.: 3 Cr.

Testing (ASTM and AASHO Standards) of Portland Cement concrete and aggregates used in making concrete. Complete reports are required at the conclusion of all tests.

1.50 Concrete   Prep. 2.23, 1.49; 3 Cl.; 3 Cr.

Fundamental principles involved in the theory of reinforced concrete behavior; analysis and design of elementary members; shear, bond, and anchorage; discussion of specifications and current practice.

1.51 Concrete   Prep. 1.50; 4 Cl.; 4 Cr.

Diagonal tension; design of vertical and inclined stirrups; analysis and design of axially loaded columns; shrinkage and plastic flow; combined bending and axial effects; continuous reinforced concrete structures; interpretation of the "ACI Building Code Requirements for Reinforced Concrete."

1.54 Design of Structures   Prep. 2.23; 3 Cl.; 2 Cr.
Lectures and problem work in designing connections for various structural elements using rivets and welding; connections with concentric and eccentric loadings.

1.55 Design of Structures   Prep. 1.54; 3 Cl.; 2 Cr.
Design of moment connections for fixed ended beams; design of individual members in a structural framework. Shop drawings are made for the members as designed.

1.56 Design of Structures   Prep. 1.55; 4 Cl.; 3 Cr.
Complete design and drawing of a plate girder for a building or bridge; design of reinforced concrete beams and footings; design of continuous beams, both steel and concrete.

1.60 Construction Engineering   3 Cl.; 3 Cr.
An introduction to the legal aspects of contracts, specification writing, and the Critical Path Method as applied to the construction industry. Estimating construction costs by direct and indirect methods.

1.70 Geology   3 Cl.; 3 Cr.
Origin of the earth, geological time scale. Minerals, rocks, introduction to mineralogy. Formation of physical earth features. Weather and erosion; stream and shoreline effects; glaciers and glaciation; earth movements, earthquakes; geological mapping and exploration.

1.71 Engineering Geology   3 Cl.; 3 Cr.
Relationships between geologist and engineer. Engineering materials in nature. Hydrological cycle. Stream and shoreline protection. Earthquakes. Construction in permafrost regions. Dams, reservoirs; tunnel techniques. Geophysical exploration of construction sites. Economic considerations relating to geology and engineering.

1.72 Soil Mechanics   4 Cl.; 4 Cr.
Consideration of granular and cohesive soils, their classification and identification, determination of soil properties, phase relationships, shear strength and the theory of consolidation. Special consideration of those aspects of soil mechanics which apply to the design of spread footings, pile foundations and retaining walls.

1.80 Materials of Construction   Prep. 11.04; 3 Cl.; 3 Cr.
A study of the physical properties of construction materials, including inorganic materials such as cement, ceramics, glass, plaster, stucco; and organic materials such as plastic, wood, and ferrous and nonferrous metals and alloys. Consideration is given to insulating materials.

1.90 Municipal & Sanitary Engineering I   Prep. 1.21; 6 Cl.; 3 Cr.

Fiscal planning — capital budget, annual costs, comparison of alternatives, methods of financing.

Municipal Administration — forms of municipal government, planning func-

tions. Public Works Administration.

City Planning — population studies, zoning.

Public Health Engineering — garbage and refuse disposal, milk and food sanitation, insect and rodent control, air pollution control.

1.91 Municipal & Sanitary Engineering II   Prep. 1.90; 4 Cl.; 4 Cr.
Unit operations of water and sewage treatment. Flow sheets of water and sewage treatment plants. Hydraulic design of treatment plants. Elements of stream sanitation.

1.92 Municipal & Sanitary Engineering III   Prep. 1.91; 3 Cl.; 3 Cr.
Elements of Statistical Analysis — applications to determination of reservoir size, flood frequencies, rainfall intensity and duration — frequency analysis. Design of water supply facilities (ground water and surface water). Design of water distribution systems. Design of sanitary and storm sewer systems.

1.93 Municipal & Sanitary Engineering IV   Prep. 1.91; 3 Cl.; 3 Lab.; 4 Cr.
(Optional elective in place of 1.56 — Design of Structures.) Layout of water treatment and sewage treatment plants. Instrumentation, mechanical and electrical features. Special concrete design features. Biology of water and sewage. Sanitary Engineering Laboratory and reports.

Mechanical Engineering

2.13 Mechanism   Prep. 2.21; 3 Cl.; 3 Cr.
Mathematical and graphical treatment of problems involving translatory and rotary motion, velocity and acceleration analysis, vector analysis, linkages, rolling contact, gears, mechanism trains, and miscellaneous motions.

2.14 Machine Design   Prep. 2.24, 2.43; 3 Cl.; 2 Lab.; 4 Cr.
Application of theoretical principles with practical details in design work such as keys, pins, weldments, brakes, couplings, springs, screws, and belting. Items included in the design are the effects of stress concentrations, fluctuating loads for ductile or brittle materials, column effect, theories of failure, torsion of circular or odd-shaped cross-section, and combinations of torsional loading with flexure.

2.15 Machine Design   Prep. 2.14; 3 Cl.; 2 Lab.; 4 Cr.
Application of theoretical mechanics and materials to problems of lubrication, flywheels, ball and roller bearings, spur, bevel, and worm gears, shrink and press fits. Optimum design and creative design are included in a project study.

2.16 Principles of Feedback Control   Prep. 14.68; 3 Cl.; 3 Cr.
Basic theoretical background for analyzing and designing feedback control systems. Formulation of transfer functions and block diagrams representing physical systems. Transient and frequency response, Laplace transform techniques. Stability criteria, root locus.

2.20 Applied Mechanics (Statics)   Prep. 14.55, 15.52; 4 Cl.; 4 Cr.
Basic concepts, moments, couples, vector representation. Resultants and
equilibrium of force systems, including external and internal forces, in two
and three dimensions. Friction; first and second moments of areas.

2.21 Applied Mechanics (Kinetics)   Prep. 2.20, 14.66; 6 Cl.; 3 Cr.
Moments of inertia of masses. Kinetics and dynamics of bodies in transla-
tion, pure rotation, general plane motion under conditions of uniform or
variable acceleration, and impulse and momentum.

2.22 Strength of Materials   Prep. 2.21; 4 Cl.; 4 Cr.
Physical properties of materials; stress-strain relations; effect of tempera-
ture on strains and stresses of bodies; energy absorption and resilience;
axially loaded indeterminate members; stresses in thin cylinders and spheres;
riveted and welded connections; torsion in circular members; shear and
bending moments in beams; stresses in beams and beam design.

2.23 Strength of Materials   Prep. 2.22; 3 Cl.; 3 Cr.
Determinate and indeterminate beam deflections and reactions by integra-
tion, moment-area, moment distribution, energy methods, and theory of three
moments; column action.

2.24 Advanced Mechanics   Prep. 2.23; 3 Cl.; 3 Cr.
Two- and three-dimensional state of stress at a point; relationships between
stress and strain; theories of failure; curved beams and unsymmetrical load-
ing of beams; thick cylinders and thin plates.

2.26 Engine Dynamics   Prep. 2.21, 14.68; 3 Cl.; 3 Cr.
Momentum principles and the application to gyroscopes; Coriolis' law;
treatment of single degree of freedom vibrations.

2.27 Fluid Mechanics   Prep. 1.20; 3 Cl.; 3 Cr.
Fluid properties and definitions. Fluid statics. Fluid-flow concepts and
basic equations. Viscous effects — fluid resistance. Dimensional analysis
and dynamic similitude. Frictionless compressible flow.

2.28 Fluid Mechanics   Prep. 2.27; 3 Cl.; 3 Cr.
Two-dimensional ideal fluid flow, applications of fluid mechanics; turbo-
machinery, measuring of flow, closed-conduit flow. Flow in open channels.
Automatic fluid controls — oil hydraulic systems.

2.29 Experimental Stress Analysis   Prep. 2.24; 4 Cl.; 4 Cr.
Theory and application of various methods of stress analysis; theory and ex-
perimental procedures involved in use of photoelasticity, photostress, the
electric resistance strain gage and brittle coatings as applied to stress
analysis problems; experiments illustrating the analysis procedure.

2.43 Materials and Metallurgical Processes   Prep. 11.04; 3 Cl.; 3 Cr.
The structure of metals; the solid state; mechanical properties; phase equi-
librium for one- and two-component systems; the hardening of metals; reliev-

ing work effects; the production of iron and steel, e.g.; production processes, heat treating; mechanical working processes, and joining processes.

2.44 Physical Metallurgy   Prep. 2.43; 3 Cl.; 3 Lab.; 4 Cr.
Crystallography, e.g., atomic structure, bonding mechanisms, lattice planes, the solid state, etc.; phase equilibrium for one-, two- and three-component systems; ferrous physical metallurgy, including iron, steel (low and high alloy) and cast irons; nonferrous physical metallurgy, including copper, aluminum and uranium base alloys; solidifications; diffusion; effect of deformation on metals; and effect of temperature on metals, e.g., relieving plastic work effects.

2.46 Metal Processing   Prep. 2.43; 4 Cl.; 6 Lab.; 3 Cr.
Fits and tolerances; tool materials treatment, life and power requirements; chip formation; cutting fluids; machine tools and operations; gears and their manufacture.

2.60 Mechanical Engineering Laboratory   Prep. 1.20, 2.23, 2.83; 3 Lab.; 2 Cr.
A preliminary laboratory course to familiarize the students with methods available for the measurement of standard characteristics of force, length, area, speed and power, flow of compressible and incompressible fluids, including air, water and steam. Short reports are required.

2.61 Mechanical Engineering Laboratory   Prep. 2.60; 3 Lab.; 2 Cr.
This laboratory course and those following are designed to enable the student to conduct tests on power plant equipment and in the field of testing materials. Digital computer techniques are introduced in this course utilizing the IBM 1620 computer. Tests are conducted on internal combustion engines, testing machines, areodynamic equipment, and refrigeration equipment. Complete engineering reports are required.

2.62 Mechanical Engineering Laboratory
                                  Prep. 2.61, 2.24, 2.28, 2.85; 4 Lab.; 3 Cr.
Tests and experiments on heat transfer, fluid flow, strength of materials, steam prime movers, and vibrations. Complete engineering reports are required.

2.63 Mechanical Engineering Laboratory   Prep. 2.26; 4 Lab.; 3 Cr.
Projects are assigned on current topics of interest, such as internal combustion engines, refrigeration, vibrations, experimental stress analysis, fluid flow, and materials testing. Complete engineering reports are required.

2.64 Materials Testing Laboratory   Prep. 2.23, 2.43; 1 Cl.; 4 Lab.; 3 Cr.
The techniques of testing are emphasized through the determination of properties of steel, brass, aluminum, plastics, wood, and other composite organic and inorganic materials by running tension, compression, flexure, shear, impact, hardness, electrical resistivity, thermal conductivity, water absorption, fatigue, and creep tests.

2.80 Heat Engineering   Prep. 14.66, 15.66; 4 Cl.; 4 Cr.
Introduction to the principles of thermodynamics, including the first and
second laws, perfect gases, vapor tables, and simple thermodynamic proc-
esses; equipment used in modern power plants.

2.81 Heat Engineering — Thermodynamics   Prep. 14.66, 15.56; 4 Cl.; 4 Cr.
Fundamentals of thermodynamics: general theory of heat and matter, laws
of thermodynamics, availability of energy, entropy, equations of state of
fluids, laws of perfect gases, specific heats, properties of liquids and vapors,
development and use of vapor tables and charts, thermodynamic processes
of materials, general equations of thermodynamics.

2.82 Heat Engineering   Prep. 2.81; 3 Cl.; 3 Cr.
Principles of thermodynamics applied to the various phases of heat engi-
neering; theory of vapor engines; analysis of the types of actual engines
used with their controlling devices and their operating characteristics, effi-
ciencies, and capacity measures. Steam boilers, feed water heaters, and
other power plant auxiliaries are considered from the equipment and per-
formance viewpoints; theory of gas and vapor flow through orifices and
nozzles.

2.83 Heat Engineering (Heat Transfer)   Prep. 2.82; 6 Cl.; 3 Cr.
An introduction to the principles of heat transfer; study of equations govern-
ing heat flow by conduction through walls, cylinders, and spheres. Unsteady
state heat conduction; graphical, mathematical, and numerical methods.
Principles of natural and forced convection to include dimensionsal analysis,
dimensionless groups, and applications of those equations to heat ex-
changer design. Fundamentals of radiation are also discussed.

2.84 Heat Engineering (Refrigeration and Air Conditioning)
                                                       Prep. 2.83; 4 Cl.; 4 Cr.
A detailed study of the vapor compression system of refrigeration; evaporator
and condenser design; low-temperature refrigeration cycles, both multi-stage
and cascade types; multiple evaporator and compressor combinations; gen-
eral principles of gas compression; psychometrics, enthalpy potential with
application to cooling towers and air conditioning systems; basic principles
of thermo-electricity with application to heat pumps and refrigeration
systems.

2.85 Heat Engineering   Prep. 2.84; 4 Cl.; 4 Cr.
Conversion of energy to power by spark ignition, diesel, and free piston en-
gines, as well as direct conversion by fuel cells and MHD cycles. Considera-
tion of combustion phenomena and computations (heating values, free en-
ergy, chemical equilibrium, and combustion temperatures). The combustion
charts are applied to various types of engines after the air standard cycle
analysis has been developed.

2.86 Heat Engineering — Turbines   Prep. 2.85; 3 Cl.; 3 Cr.
Steam turbines, dynamic action of jets on moving blades, velocity diagrams,
calculations of turbine efficiencies, turbine losses, lubrication, governing
mechanisms, design of a turbine; principles, performance, and construc-
tional details of gas turbines.

2.87 Power Plant Engineering   Prep. 2.85; 4 Cl.; 4 Cr.
Topics and problems taken from engineering practice; principles and methods of analyzing power plant economic problems, cost, operation, and selection of power plant equipment to determine type best suited for conditions and location.

2.88 Introduction to Nuclear Engineering   Prep. 15.56; 6 Cl.; 3 Cr.
The structure of the atom with particular emphasis on the nucleus. The characteristics and detection of alpha, beta, and gamma radiation. Nuclear reactions. Isotope formation and radioactive decay. Cross sections for absorption, scattering, and fission.

2.89 Nuclear Engineering   Prep. 2.88; 4 Cl.; 4 Cr.
Broad survey of various areas of nuclear technology. Studies of types of reactors, elementary reactor theory, waste disposal, health physics, radiation detection, use of radioisotopes.

2.91 Mechanical Engineering Honors Project   3 Cr.
By permission of the Department, students with high scholastic standing may substitute an "Honors Project" for 2.62, Mechanical Engineering Laboratory. Such projects may be of an analytical, a design, or an experimental nature. A formal report is submitted to the student's supervisor at the end of the term.

2.92 Mechanical Engineering Honors Project   3 Cr.
A continuation of 2.91 which may be substituted for 2.63, Mechanical Engineering Laboratory. A final report is required.

Electrical Engineering

3.01 Electrical Engineering   Prep. 15.53, 15.54; 3 Cl.; 3 Cr.
Basic principles of circuit theory for non-electrical engineering students. Network topology, mesh and node equations and equivalent circuits. Physics of conduction and non-ideal behavior of resistive components. Energy-storage circuit theory.

3.02 Electrical Engineering   Prep. 3.01; 3 Cl.; 3 Cr.
Time and frequency-domain behavior of R-L-C circuits. Second-order differential equation analysis of energy-storage circuits. Physics of energy-storage elements.

3.03 Electrical Engineering   Prep. 3.02; 3 Cl.; 3 Cr.
Active elements; semiconductors, vacuum tubes, system concepts applied to rotating machinery, transformers, amplifiers and combinations of elements in feedback and control systems.

3.04 Electrical Engineering   Prep. 15.53, 15.54; 3 Cl.; 3 Lab.; 4 Cr.
For the chemical engineering student in the application of electrical engi-
neering to industrial processes. Basic d-c and a-c circuit theory; elementary
theory of electron tubes; characteristics and associated circuits of high-
vacuum diode and triode thyratron and phototube. Laboratory exercises ac-
company the lecture course, including computer programming.

3.05 Electrical Engineering   Prep. 3.04; 3 Cl.; 3 Cr.
Application to industrial processes of those devices studied in 3.04. Operat-
ing characteristics of d-c motors and generators, a-c motors, transformers;
control and regulation of motor speed and generator voltage; basic theory of
feedback. Laboratory demonstration periods accompanying the lectures.

3.09 Transmission Lines   Prep. 3.54; 3 Cl.; 3 Cr.
Analysis of the transmission line as a distributed circuit. Wave equations;
propagation; transient phenomena; sinusoidal steady-state solution of prob-
lems for lossy and lossless lines using transmission line charts.

3.19 Field Theory I   Prep. 14.68; 3 Cl.; 3 Cr.
Introduction to electromagnetic fields; vector analysis; development of Max-
well's equations in differential and integral form from considerations of
circuit theory; electrostatics and magnetostatics.

3.29 Field Theory II   Prep. 3.19; 3 Cl.; 3 Cr.
A continuation of 3.19. Polarization and magnetization vectors; uniqueness
theorems for static fields; calculation of parameters of circuit theory and
transmission lines for special geometrics; plane waves in dielectric and
conducting media; normal incidence on a plane interface.

3.32 Networks and Filters   Prep. 3.28; 3 Cl.; 3 Cr.
Review of network analysis and characteristics of passive four-terminal net-
works; ladder filters; introduction to modern network synthesis.

3.39 Field Theory III   Prep. 3.29; 4 Cl.; 4 Cr.
A continuation of 3.29. Plane waves; elliptical polarization; oblique inci-
dence on a plane interface; the rectangular waveguide; the linear antenna;
motion of charged particles in static fields; propagation in an isotropic
media.

3.51 Electrical Engineering I   Prep. 15.53, 15.54; 3 Cl.; 3 Cr.
Introductory course to electric-circuit theory covering Kirchhoff's laws, net-
works, solutions by the loop and nodal methods; solution of linear simul-
taneous equations as applied to resistance methods; Thèvenin's, Norton's,
and reciprocity theorems. Discussion of typical networks.

3.52 Electrical Engineering II   Prep. 3.51; 3 Cl.; 3 Cr.
Transient phenomena of the first and second order for various combinations
of resistance, inductance, and capacitance. Singularity functions and im-
pulse response. Complex representation of sinusoids.

3.53 Electrical Engineering III
Prep. 3.52; 6 Cl.; 3 Cr.

Behavior of circuits when excited in the sinusoidal steady state. Impedance as viewed in the frequency domain, resonance, magnitude and frequency scaling, vector diagrams, and mutual inductance. Energy and power, both active and reactive.

3.54 Electrical Engineering IV
Prep. 3.53; 4 Cl., 3 Cr.

Principles of magnetic circuits with d-c and/or a-c excitation. Permanent magnets. Air-core transformers and magnetic coupling. Single-phase power-transformer theory and application. Audio transformers.

3.55 Electrical Machinery I
Prep. 3.54; 3 Cl.; 3 Cr.

Introduction to a unified theory of electrical machinery wherein the rotating machine is regarded as a general electromechanical energy-conversion device. D-c machines; analysis of their performance on a linear and nonlinear basis; dynamic characteristics of control and application.

3.56 Electrical Machinery II
Prep. 3.55; 3 Cl.; 3 Cr.

General theory, linear and non-linear characteristics of synchronous generators and motors; dynamic operating characteristics.

3.57 Electrical Machinery III
Prep. 3.56; 3 Cl.; 3 Cr.

3.55 and 3.56 extended to polyphase induction motors, fractional-horsepower a-c motors, and special purpose machines.

3.59 Signal Analysis & Linear Systems
Prep. 3.53, 14.68; 6 Cl.; 3 Cr.

The analysis of pulse and periodic signals. Energy and power spectra and random functions. The transmission of signals through generalized linear systems.

3.60 Servomechanisms
Prep. 3.80; 3 Cl.; 3 Cr.

Analysis and design of simple servomechanisms through the use of the Laplace transform. System adjustments, compensation methods, and optimum design techniques. Typical automatic-control devices.

3.70 Electronics I
Prep. 3.53; 3 Cl.; 3 Cr.

Electron tubes and transistors. Motion of electrons in electric and magnetic fields, elements of solid-state physics, static and dynamic characteristic curves for vacuum tubes and transistors, graphical location of operating points, and incremental-parameter equivalent circuits.

3.71 Electronics II
Prep. 3.70; 3 Cl.; 3 Cr.

Design, calculation, and operation of basic vacuum-tube and transistor circuits. Grounded-cathode, grounded-plate, and grounded-grid vacuum-tube circuits, grounded-emitter, grounded-collector, and grounded-base transistor circuits. Direct-coupled, R-C coupled, and transformer-coupled stages. Equivalent circuits and graphical methods of solution.

3.72 Electronics III
Prep. 3.71; 3 Cl.; 3 Cr.

Video amplifiers, r-f tuned amplifiers, feedback amplifiers and oscillators.

Compensation of vacuum-tube and transistor amplifiers for shunt capacitance; coupling capacitance and temperature effects; vacuum-tube and transistor tuned amplifiers, both narrow band and stagger tuned; feedback amplifiers; Bode's general formula; vacuum-tube and transistor oscillators; criteria for oscillation; frequency stabilization.

3.73 Electronics IV   Prep. 3.72; 3 Cl.; 3 Cr.
Analysis and design of basic pulse circuits. Vacuum-tube and solid-state versions of bistable, monostable and astable multivibrators are covered. A brief treatment of Boolean algebra as applied to logic circuits is involved.

3.74 Electronics V   Prep. 3.73; 3 Cl.; 3 Cr.
Introduction to classical modulation theory and a brief mention of more recent developments in communication theory. The first category includes the treatment of amplitude modulation and related systems, frequency modulation, and various pulse modulation systems. The second part of the course touches on such concepts as signal space, information content, entropy, and channel capacity.

3.80 Transients in Electric Circuits   Prep. 3.53, 14.68; 3 Cl.; 3 Cr.
Theory of the Laplace transform, and the principles applied in the solution of lumped-parameter electric-circuit problems. Partial-fraction expansions, solutions to higher-order algebraic equations, singularity functions, and convolution methods.

3.90 Electrical Engineering Laboratory I   Prep. 3.54; 6 Lab.; 3 Cr.
Experiments on series and parallel a-c circuits, instrument calibration, resistance measurements, network theorems, and transformer testing.

3.91 and 3.92 Electrical Engineering Laboratories II and III
                                    Prep. 3.70; 3 Lab.; 3 Cr. per term
Experiments in the general area of electrical measurements and basic electronics. Also involved are experiments in basic digital computer theory and logic devices.

3.93 Electrical Engineering Laboratory IV   Prep. 3.15, 3.54, 3.71; 3 Lab.; 3 Cr.
Experiments in three-phase circuits and magnetic devices. In addition, the student conducts projects in the field of semiconductors terminating with experimentation of his own choice.

3.94 Electrical Engineering Laboratory V   Prep. 3.55, 3.29, 3.72; 12 Lab.; 6 Cr.
Experiments in the fields of power and communications. Basic principles of operation of energy-conversion devices. Microwave circuits and devices, pulse circuits, frequency modulation, analog and digital computers, etc.

3.95 Electrical Engineering Laboratory VI   Prep. 3.29, 3.55; 3 Lab.; 4 Cr.
Application of electronic control and regulatory circuits (including servo-mechanisms). Pulse-forming and delay lines, and slotted lines for u-h-f im-

pedance measurements.

3.96 Electrical Engineering Laboratory VII   Prep. 3.56; 3 Lab.; 3 Cr.
Experiments on synchronous generators and motors, and induction motors. In addition, a project is allowed involving experimentation in areas of the student's choice.

Chemical Engineering

4.42 Properties of Materials   Prep. 11.65, 15.41; 2 Cl.; 2 Cr.
Modern theories of solid state physics, emphasizing the molecular concepts on which the physical properties of engineering materials depend.

4.43 Engineering Materials   Prep. 11.04, 15.41, 4.42; 3 Cl.; 3 Cr.
Materials encountered in the chemical engineering profession. Effect of composition, heat treatment, and mechanical work upon the physical properties of metals and their alloys.

4.44 Industrial Processes   Prep. 4.62, 4.63; 3 Cl.; 3 Cr.
Major chemical-process industries studied with emphasis on kinetic and thermodynamic principles in design and operation of the plant. Comprehensive problems.

4.46 Introduction to Nuclear Engineering   Prep. 15.41, 14.66; 4 Cl.; 4 Cr.
Review of nuclear physics. Nuclear fission, the nuclear chain reactor, reactor theory, radiation shielding, materials of construction, reactor instrumentation and control, separation of stable isotopes, chemical separations and processing, and special techniques of nuclear engineering.

4.50 Introduction to Chemical Engineering   Prep. 11.02, 15.52; 4 Cl.; 2 Cr.
Fundamental concepts of the chemical engineering profession. Humanistic as well as the scientific side of the profession. Mathematical tools and stoichiometric relations.

4.51 Chemical Engineering Literature   Prep. 4.50; 1 Cl.; 1 Cr.
Sources of information available to chemical engineers. Series of literature search problems.

4.52 Chemical Engineering Calculations   Prep. 4.50; 4 Cl.; 4 Cr.
Chemical engineering fundamentals, including material balance, energy balance, static equilibria, dynamic equilibria, and economic balance. Essentially a problem course.

4.60 Fluid Mechanics   Prep. 15.52, 4.50; 5 Cl.; 3 Lab.; 3 Cr.
Fundamental principles of fluid mechanics. Methods of determining rates of flow and power consumption of fluids flowing through pipe lines. Flow of gases and oils. Laboratory work.

4.61 Chemical Engineering Thermodynamics   Prep. 4.52, 14.67; 3 Cl.; 3 Cr.
First law developed for batch and flow systems. Heat effects in physical and chemical processes. Equations relating the thermodynamic functions of

fluids to variables of state. Second law, and preparation of tables and charts of thermodynamic properties from equations.

4.62 Chemical Engineering Thermodynamics   Prep. 4.61; 4 Cl.; 4 Cr.
Charts and tables of thermodynamic properties of substances used to analyze and solve process problems. Physical and chemical equilibria. Applications of first and second laws, compression and expansion of fluids.

4.63 Chemical Engineering Kinetics   Prep. 4.62; 4 Cl.; 4 Cr.
Distinctions between rates and equilibria, units of reaction rates, the reaction velocity constant, and methods of determining reaction orders. Principles of reactor design applied to homogeneous batch and flow reactions. Catalysis theory, transfer of heat and mass in catalytic beds, catalytic reactor design, and uncatalyzed heterogeneous reactions.

4.70 Heat Transfer   Prep. 4.60, 4.52; 5 Cl.; 3 Lab.; 3 Cr.
Basic concepts of heat transfer by conduction, convection, and radiation. Resistance to heat transfer of fluid films. Laboratory experiments.

4.71 Chemical Engineering   Prep. 4.60, 4.52, 4.70; 4 Cl.; 4 Lab.; 6 Cr.
Application of chemical engineering fundamentals to mechanical separations, evaporation, air conditioning, and drying. Laboratory experiments. Students take an active part in planning the mode of operation of the equipment and the data to be taken. Report writing.

4.72 Chemical Engineering   Prep. 4.71; 4 Cl.; 4 Lab.; 6 Cr.
Mass transfer techniques stressing the physical mechanisms involved in the transfer of material between homogeneous phases. Absorption, distillation, and extraction. Laboratory work.

4.80 Process Engineering Economics   Prep. 4.51, 20.12; 6 Cl.; 3 Cr.
Fundamentals of economics and statistics applied to research, raw materials, markets, labor, power, water, transportation, labor relations and similar economic factors as related to the process industries. Laws relating to waste disposal, atmospheric and stream pollution, and patents.

4.82 Chemical Plant Costs   Prep. 4.51, 4.80; 3 Cl.; 3 Cr.
Capital required and operating costs for a plant to produce a specified annual tonnage of one or more chemical materials. Equipment necessary to carry out the processes selected and buildings required to house the plant determined. Sources of cost data available without inquiry to manufacturers are searched out and drawn upon fully in making the estimates. Report of evaluation of the venture based upon these data and sound economic principles.

4.91 Process Design   Prep. 4.71, 4.72; 1 Cl.; 6 Lab.; 6 Cr.
Process design engineering using fundamentals of engineering science and economics studied in previous courses. Preparation of process flow sheets, complete material and energy balances, selection of equipment, and design of small chemical-processing units.

4.92 Process Design   Prep. 4.91; 6 Lab.; 5 Cr.
Process design of a complete chemical plant and the evaluation of the
economic factors involved.

4.93 Projects   Prep. 4.71, 4.72; 1 Cl.; 6 Lab.; 6 Cr.
Individual research related to some phase of chemical engineering. Open
only to students selected by the department head on the basis of scholarship
and proved ability. Research topic selected by mutual agreement of the
student and his supervising professor.

4.94 Projects   Prep. 4.93; 6 Lab.; 5 Cr.
A continuation of the research work undertaken in 4.93.

Industrial Engineering

5.03 Industrial Management   3 Cl.; 3 Cr.
For electrical engineering majors. General problems of competitive industry
and modern scientific management principles and methods. Industrial sys-
tems and social effects of mechanization; legislation; labor unions; educa-
tion; organization and financing of modern industry.

5.08 Probability Theory   4 Cl.; 2 Lab.; 3 Cr.
Basic probability theory covered here includes set theory, combinatorial
analysis, Bayes theorem, independence, functions of random variables, joint
distribution functions, conditional probability, the Binomial, Poisson, Hyper-
geometric, Exponential, and Normal distributions.

5.09 Statistical Inference   Prep. 5.08; 2 Cl.; 2 Lab.; 3 Cr.
Review of probability from 5.08. Tests of hypotheses, student's t distribu-
tion, chi-square distribution, F distribution, point estimation, confidence
interval estimation, sampling inspection, analysis of variance.

5.10 Industrial Management   3 Cl.; 3 Cr.
Administrative and managerial aspects of plant operation. Background and
evolution of modern industrial management; ownership of industry; plant
location and buildings; factory layout and equipment; purchasing function;
production planning and control. Problems facing management today.

5.11 Industrial Management   Prep. 5.10; 3 Cl.; 3 Cr.
Inspection and quality control functions; motion and time study; classifica-
tion systems; cost accounting; maintenance; wage and salary administration;
industrial safety.

5.12 Methods Time Analysis   3 Cl.; 3 Lab.; 4 Cr.
Functions of the factory staff department commonly known as the Methods
Department. Process analysis, process charts and flow diagrams; operation
analysis, operation charts, man-and-machine charts, and micromotion study;
principles of motion economy applied to all phases of factory operation, cleri-
cal and mechanical. Laboratory application to a typical factory operation.

5.13 Methods Time Analysis   Pre. 5.12; 3 Cl.; 3 Lab.; 4 Cr.

Time study techniques and procedures; use of timing devices; performance rating; application of allowances for unavoidable lost time and computation of a fair work standard. Technique of setting standards by means of predetermined time systems.

5.17 Production Planning and Control   3 Cl.; 3 Cr.

Production routing, scheduling, and dispatching; inventory control models, including deterministic and stochastic demands, fixed and stochastic lead times, quantity discounts; critical path scheduling.

5.18 Quality Control   Prep. 5.09; 3 Cl.; 2 Lab.; 3 Cr.

Problems involved in setting up a quality control program within the factory. Fundamentals of statistical quality control; theory and application of various types of control charts; sampling methods and the statistics of reliability.

5.19 Personnel Administration I   3 Cl.; 3 Cr.

Personnel function as an element of management. Humanistic side of personnel relations as opposed to the technical aspects. Development of a sound philosophy of employer-employee relations.

5.20 Personnel Administration II   3 Cl.; 3 Cr.

Job evaluation techniques; problems of installing and maintaining job and position-evaluation systems and wage incentives in industrial enterprises.

5.22 Process Planning and Tool Design   Prep. 2.43; 5 Cl.; 5 Lab.; 3 Cr.

Principles and procedures of planning productive processes to manufacture articles at lowest cost consistent with volume; operation analysis; tool layout; design of jigs, fixtures, and other special tools; synthetic time standards in tool design.

5.23 Plant Layout and Material Handling   Prep. 5.22, 5.27; 3 Cl.; 3 Lab.; 4 Cr.

Industrial plant design; data collection and analysis for effective layout arrangements; application of linear programming, queuing theory and engineering economy to materials handling and layout problems.

5.24 Industrial Engineering Laboratory   4 Lab.; 3 Cr.

Computer programming and automatic data processing; compilers for digital computers which can be utilized for scientific problem-solving; emphasis on the FORTRAN compiler for the IBM 1620 computer; problems drawn from all areas of industrial engineering.

5.25 Engineering Economy   Prep. 5.13, 5.18, 5.20; 4 Cl.; 4 Cr.

Economic analysis in formulating business policies, with emphasis on engineering aspects; criteria and technique of engineering economy as related to cost, economy of design, economy of selection, and application of engineering projects.

5.26 Seminar   2 Cl.; 2 Cr.

Summation and correlation of prior work with emphasis on relation to the over-all management problem and health of the enterprise; selected topics from current problems and literature in industrial engineering. Prep. senior standing in industrial engineering.

5.27 Operations Research   Prep. 5.09, 14.30; 4 Cl.; 4 Cr.

Recent developments in operations research as a management tool for decision-making. Treating of topics including linear programming, queuing theory, inventory models, design of experiments, analysis of variance.

5.28 Operations Research Problems   Prep. 5.27; 2 Cl.; 2 Cr.

Continuation of 5.29 with emphasis on dynamic programming and dynamic models, systems simulation. Emphasis on practical problems solution in above topics. Includes study and use of a simulated management game.

Biology

10.01 General Biology   2 Cl.; 3 Lab.; 3 Cr.

Fundamental principles of the various fields of biology, beginning with the physical, chemical, and biological characteristics and behavior of protoplasm and cells; general plant and animal histology; irritability and conduction.

10.02 General Biology   Prep. 10.01; 2 Cl.; 3 Lab.; 3 Cr.

Plant and animal metabolism; maintenance of the internal environment; gametogenesis and cell division.

10.03 General Biology   Prep. 10.02; 2 Cl.; 3 Lab.; 3 Cr.

Principles of genetics and eugenics; basic patterns of embryology; plant life histories.

10.04 General Biology   Prep. 10.03; 3 Cl.; 3 Lab.; 2 Cr.

Life histories of animals; organic evolution; bioecology.

10.20 Basic Microbiology   Prep. 10.04; 3 Cl.; 3 Lab.; 4 Cr.

Biology of microorganisms, emphasizing the bacteria. Preparation of media, methods of sterilization, staining, isolation, and identification of pure cultures. Studies on biochemical activities and effects of physical agents.

10.21 Basic Microbiology   Prep. 10.20; 3 Cl.; 3 Lab.; 4 Cr.

Introduction to the bacteriology of water, sewage, air, and milk. Consideration of standards, plate counts, and physiological tests for water and milk; a bacterial analysis of air and the treatment and proper disposal of sewage.

10.30 Introduction to Medical Technology   6 Cl.; 3 Cr.

An introduction to the methods, principles, and theories of medical technology.

10.31 Hematology   Prep. 10.30; 3 Cl.; 3 Lab.; 4 Cr.

The normal and pathologic morphology of the blood and blood-forming organs with emphasis on the study of the blood from the viewpoint of diagnosis and prognosis.

10.32 Human Anatomy   3 Cl.; 3 Lab.; 4 Cr.

The structure and functions of the human body.

10.33 Immunology   Prep. 10.31; 2 Cl.; 3 Lab.; 2½ Cr.

Resistance to infectious diseases, including the properties and behavior of antisera and antigenic substances.

10.40 Physiology   3 Cl.; 3 Lab.; 4 Cr.

Properties of living protoplasm, the general organization and function of cells, translocation of materials and the organization of animals. The physiology of the skeletal systems of man and animals; the physiology of amoeboid, ciliary and contractile movement with emphasis on muscle metabolism. The structure and function of neurons, reflex arcs, the autonomic nervous system and the sensory receptors.

10.41 Physiology   Prep. 10.40; 2 Cl.; 3 Lab.; 3 Cr.

Fluid media of animals, emphasizing water and electrolyte balance and kidney function in many; the physiology of blood, including its formation, functions, clotting, antigens and tests for identifying blood. The physiology of the heart, nervous control of the vascular system, breathing and gas transport, heat regulation, nutrition, digestion and assimilation; a survey of the endocrine secretions and the physiologic aspects of reproduction.

10.55 Comparative Vertebrate Anatomy   Prep. 10.02; 3 Cl.; 3 Lab.; 4 Cr.

Development and significance of the structural changes in the chordate groups; homology, analogy, metamerism, cephalization. General features of embryological development of the chordates, basic principles of phylogenesis, and the geological time scale provide a broad background for the interpretation of the significant morphological changes.

10.56 Comparative Vertebrate Anatomy   Prep. 10.55; 3 Cl.; 3 Lab.; 4 Cr.

Ontogenetic and phylogenetic development of the digestive, circulatory, respiratory, excretory, reproductive, and nervous systems.

10.57 Invertebrate Zoology   Prep. 10.04; 3 Cl.; 3 Lab.; 4 Cr.

Morphology, embryology, and histology of acoelomate animal phyla approached from the phylogenetic standpoint.

10.58 Invertebrate Zoology   Prep. 10.57; 3 Cl.; 3 Lab.; 4 Cr.

Coelomate animal phyla.

10.59 Animal Histology   Prep. 10.56; 3 Cl.; 3 Lab.; 4 Cr.
Normal microscopic anatomy and the tissues of the body, including cells, cell division, cytomorphosis, and cell differentiation. Characteristics of tissues and the morphology and function of epithelial, connective, and muscular tissues.

10.60 Animal Histology   Prep. 10.59; 3 Cl.; 3 Lab.; 4 Cr.
Microscopic anatomy of nervous tissues with the histology of lymphatic, vascular, digestive, endocrine, reproductive, and sense organs.

10.61 Embryology   Prep. 10.56; 3 Cl.; 3 Lab.; 4 Cr.
Descriptive embryogeny of Amphioxus and morphological development of organ systems in the chick and pig. Principles of embryonic induction, polarity, blastulation and gastrulation; developmental and functional significance of the fetal membranes and circulation and embryology of digestive system.

10.62 Embryology   Prep. 10.61; 3 Cl.; 3 Lab.; 4 Cr.
Continued discussions of the embroyology of the circulatory, urogenital, nervous, and other systems.

10.63 Cellular and Comparative Physiology
                    Prep. senior standing; 3 Cl.; 3 Lab.; 4 Cr.
An exploration of the morphology, biophysics, and biochemistry of the cells and tissues of animals.

10.64 Cellular and Comparative Physiology   Prep. 10.63; 3 Cl.; 3 Lab.; 4 Cr.
Continuation of 10.63, including seminar reports and projects in comparative physiology.

10.65 Genetics   Prep. 10.03; 3 Cl.; 3 Lab.; 4 Cr.
Laws of inheritance as found in animals and plants, and their application to human relations, including the observational, experimental, cytological, statistical, and developmental approaches.

10.66 Genetics   Prep. 10.65; 3 Cl.; 3 Lab.; 4 Cr.
The gene and its physiological aspects in relation to development and behavior. Population genetics and evolution.

10.69 Histological Technique   Prep. 10.56; 1 Cl.; 6 Lab.; 3 Cr.
General methods of tissue preparation for purposes of microscopic study; preparation of solutions and stains; the microtome and its operation together with specific directions for fixation, clearing, hardening, embedding, section-cutting, and staining of tissues.

10.70 Histological Technique   Prep. 10.69; 1 Cl.; 6 Lab.; 3 Cr.
Practical application of the basic principles of tissue preparation and sectioning with exercises on the preparation of several tissues of the animal body portraying the qualities of selected stains and their combinations.

10.78 Seminar 1 Cl.; 1 Cr.
Discussion of the development, trends, and theoretical principles of medical technology.

10.79 Seminar 1 Cl.; 1 Cr.
Continuation of 10.78.

10.95, 10.96, 10.97, 10.98 Honors Program 4 Cr. each course
See page 91.

Chemistry

11.01 General Chemistry 3 Cl.; 3 Lab.; 4 Cr.
Fundamental ideas of matter and energy; states of matter; changes of state; symbols; equations; chemistry of hydrogen, oxygen, and water; early ideas of atoms and molecules; atomic structure.

11.02 General Chemistry Prep. 11.01; 3 Cl.; 3 Lab.; 4 Cr.
Chemical equilibrium; solutions; redox reactions; ionic equilibrium; acids and bases; properties and reactions of halogens and sulfur.

11.03 General Chemistry Prep. 11.02; 3 Cl.; 3 Lab.; 4 Cr.
Chemistry of nitrogen; qualitative analysis of cations; electrochemistry; principles of metallurgy; properties and reactions of alkali metals, alkaline earth metals, and boron family.

11.04 General Chemistry Prep. 11.03; 3 Cl.; 3 Lab.; 2 Cr.
Chemistry of carbon, silicon, tin, and lead. Terminology of organic chemistry. Hydrocarbons and their derivatives, petroleum and its refining, elements of polymer chemistry including rubber substitutes and plastics.

11.17 Quantitative Analysis Prep. 11.04; 3 Cl.; 3 Lab.; 4 Cr.
Theory and practice of volumetric analysis, standardization, neutralization, redox titrations.

11.18 Quantitative Analysis Prep. 11.17; 2 Cl.; 3 Lab.; 3 Cr.
Elements of instrumental analysis. Theory and use of colorimeter, absorption instruments, pH measurements, and chromatography.

11.26 Organic Chemistry Prep. 11.04; 3 Cl.; 3 Lab.; 4 Cr.
Molecular structure, nomenclature, properties, and reactions of aliphatic, alicyclic, and aromatic hydrocarbons. Synthesis and reactions of alcohols and phenols.

11.27 Organic Chemistry Prep. 11.26; 3 Cl.; 3 Lab.; 4 Cr.
Monofunctional compounds. Synthesis, properties, and reaction of halides, ethers, aldehydes, ketones, acids, ester, fats, amines, amides, nitriles, and azo compounds, with some attention to biological significance.

11.28 Organic Chemistry
Prep 11.27; 4 Cl.; 3 Lab.; 5 Cr.

Polyfunctional compounds. Substituted acids quinones, dyes, stereoisomerism, amino acids, carbohydrates, and proteins, with special emphasis on biological significance.

11.42 Chemical Literature
Prep. 11.55; 3 Cl.; 3 Cr.

Uses of abstracting journals; types and sources of publications; patents as sources of information; sources of financial, statistical, and industrial information. Preparation of a detailed bibliography on an original topic. Preparation of written progress reports, typical research reports, etc.

11.43, 11.44 Senior Research
9 Lab.; 3 Cr.

Experimental work under direction of staff members. Approval of department head necessary. Each course carries 3 credits and extends throughout a single term.

11.45 Biological Chemistry
Prep. 11.53 or 11-28; 4 Cl.; 4 Cr.

Chemistry of metabolism. Electrolytic equilibrium, elementary reaction mechanisms, oxidation-reduction. Enzymes. Metabolism of carbohydrates, proteins, fats, and nucleic acids.

11.46 General Chemistry and Qualitative Analysis
3 Cl.; 3 Lab.; 4 Cr.

For chemistry and pharmacy majors only. Atomic structure, valence, periodicity, symbolism, and nomenclature; molecular substances, states of matter, kinetic theory; solutions; ionic compounds; electron- and proton-transfer.

11.47 General Chemistry and Qualitative Analysis
Prep 11.46; 3 Cl.; 3 Lab.; 4 Cr.

For chemistry and pharmacy majors only. Chemical equilibrium; ionization, electrolytic equilibrium, acidity, and basicity; group properties of the representative elements; inorganic synthesis and analysis.

11.48 General Chemistry and Qualitative Analysis
Prep. 11.47; 3 Cl.; 6 Lab.; 5 Cr.

For chemistry and pharmacy majors only. The related metals; coordination compounds; electrochemistry; lanthanides and actinides; nuclear reactions; colloidal dispersions.

11.49 General Chemistry and Qualitative Analysis
Prep. 11.48; 3 Cl.; 6 Lab.; 2½ Cr.

Carbon compounds. Structure and nomenclature of hydrocarbons and the principal classes of organic functional compounds. Laboratory: simplified semimicro qualitative analysis of organic compounds.

11.50 Organic Chemistry
Prep. 11.49; 3 Cl.; 6 Lab.; 5 Cr.

Syntheses, properties and reactions of aliphatic, aromatic and alicyclic monofunctional compounds of the principal types. Electronic interpretation of reactions.

11.51 Organic Chemistry
Prep. 11.04; 3 Cl.; 3 Lab.; 4 Cr.

Aliphatic compounds. Preparation, properties and reactions of the more common classes of open-chain compounds. Electronic interpretation of structures and reactions.

11.52 Organic Chemistry   Prep. 11.50; 3 Cl.; 6 Lab.; 5 Cr.
Continuation of 11.50.

11.53 Organic Chemistry   Prep. 11.52; 3 Cl.; 3 Lab.; 4 Cr.
Bifunctional and multifunctional compounds. Stereoisomerism. Correlation
of color with structure. Polymers.

'11.54 Organic Chemistry   Prep. 11.51; 3 Cl.; 3 Lab.; 4 Cr.
Aromatic compounds. Preparation, properties and reactions of the more
common classes of aromatic compounds. Electronic interpretation of struc-
tures and reactions of aromatic compounds.

11.55 Organic Chemistry   Prep. 11.53; 3 Cl.; 3 Cr.
Heterocyclic compounds. Mechanisms of organic reactions. Correlation of
structure with acidity, basicity and reaction rates. Perhalocarbons and their
derivatives.

11.56 Organic Chemistry   Prep. 11.52 or 11.54; 3 Cl.; 3 Cr.
Carbohydrates, fats, proteins, dyes, synthetic resins, commercial solvents and
other important industrial products such as petrochemicals.

11.57 Qualitative Organic Analysis   Prep. 11.52; 9 Lab.; 3 Cr.
Qualitative analysis of organic compounds having one or two functional
groups. Single liquids, single solids, liquid mixtures, solid mixtures, and
some industrial products are analyzed.

11.58 Organic Preparations   Prep. 11.52; 9 Lab.; 3 Cr.
Advanced organic preparations, based on recent literature, and selected to
teach the laboratory techniques necessary for graduate school or industrial
organic research.

11.61 Physical Chemistry   Prep. 11.52 or 11.54; 3 Cl.; 3 Lab.; 4 Cr.
The three states of matter; solutions; phase diagrams.

11.62 Physical Chemistry   Prep. 11.61; 3 Cl.; 3 Lab.; 4 Cr.
Chemical thermodynamics.

11.63 Physical Chemistry   Prep. 11.62; 3 Cl.; 3 Lab.; 4 Cr.
Solutions of electrolytes: transference and conductance, theory of electro-
lytic solutions, ionic equilibria, electromotive force.

11.64 Physical Chemistry   Prep. 11.63; 3 Cl.; 3 Lab.; 4 Cr.
Kinetics, colloidal dispersions, correlation of physical properties with molecu-
lar constitution, and X-ray analysis of crystal structure.

11.65 Physical Chemistry   Prep. 11.62; 3 Cl.; 3 Cr.
Covers the same class material as 11.63 but does not include laboratory.

11.70 Quantitative Analysis   Prep. 11.62; 5 Cl.; 6 Lab.; 3½ Cr.
Theory and practice of gravimetric and volumetric analysis. Analysis of certain inorganic elements. Use of electrolytic methods. Statistical treatment of data.

11.71 Quantitative Analysis   Prep. 11.70; 3 Cl.; 6 Lab.; 5 Cr.
Theory and practice of gravimetric and volumetric analysis. Calibration of glassware; acidimetry and alkalinity, neutralization and precipitation methods; the use of indicators.

11.73 Analytical Chemistry   Prep. 11-62; 2 Cl.; 3 Lab.; 3 Cr.
Use of instrumental and physicochemical methods in analytical chemistry, including the types of instruments available, and the theory of their operation.

11.76 Instrumental Analysis   Prep. 11.71; 3 Cl.; 6 Lab.; 5 Cr.
Use of instrumental and physiocochemical methods in analytical chemistry, including the types of instruments available, and the theory of their operation.

11.77 Instrumental Analysis   Prep. 11.18; 3 Cl.; 3 Lab.; 4 Cr.
Use of instrumental methods in analytical chemistry, including types of instruments available and the theory of their operation.

11.81 Inorganic Chemistry   Prep. 11-62; 3 Cl.; 3 Cr.
Electronic structure, the periodic tables, nature of covalent and electrovalent bonds as illustrated by the chemistry of non-metals.

11.82 Inorganic Chemistry   Prep. 11.81; 3 Cl.; 3 Cr.
Electronic structure, the periodic table, and the nature of covalent and electrovalent bonds as illustrated by the chemistry and structure of metals.

11.91 Special Topics   Prep. 11.55, 11.64, 11.71; 3 Cl.; 3 Cr.
Advanced topics in organic chemistry. Topics vary from year to year.

11.92 Special Topics   Prep. 11.55, 11.64, 11.71; 3 Cl.; 3 Cr.
Advanced topics in physical chemistry. Topics vary from year to year.

11.93 Nuclear Chemistry   Prep. 11.64; 3 Cl.; 3 Cr.
Radioactivity, nuclear reactions, atomic fission, properties of isotopes.

11.95, 11.96, 11.97, 11.98 Honors Program   4 Cr. each course
See page 93.

Graphic Science

12.51 Engineering Graphics I   3 Cl.; 3 Lab.; 3 Cr.
Graphic representation: graphical methods for the communication, visualization, and analysis of ideas and concepts related to creative engineering.

12.52 Engineering Graphics II   Prep. 12.51; 3 Cl.; 3 Lab.; 3 Cr.
Descriptive Geometry: 3-dimensional geometry in the visualization analysis, and synthesis of graphical solutions for spatial relationship problems.

12.53 Engineering Graphics III   Prep. 12.52; 3 Cl.; 3 Lab.; 3 Cr.
Graphical Processes: graphical solutions of mathematical and physical problems using coplanar, pictorial, and multiview representations of scientific diagrams and technical charts.

12.54 Engineering Graphics IV   Prep. 12.53; 3 Cl.; 3 Lab.; 2 Cr.
Synthesis of representational, geometric, and analytical methods in the graphical conceptualization and development of engineering designs and solutions.

12.61 Graphical Computation   6 Cl.; 3 Cr.
Geometrical representation, analysis, and solution of mathematical and physical problems by graphical methods.

12.63 Chart Analysis   5 Cl.; 2½ Cr.
Evaluations and predictions based on facts and relationships depicted on various types of charts and graphs.

12.65 Elements of Nomography   8 Cl.; 4 Cr.
Graphical solutions of equations through alignment diagrams based on plane geometry relationships.

12.67 Introduction to Cartography   8 Cl.; 4 Cr.
Analysis of maps and their cultural, historical, sociological, economic, geopolitical, etc., implications.

12.68 Geometry in Cartography   6 Cl.; 3 Cr.
Systems of map projection and their effect on representations of the earth's geographical features.

12.69 Illustration for Teachers   8 Cl.; 3 Cr.
Survey and development of methods for supplementing and illustrating oral classroom presentations.

Geology

13.10 Geology of New England   5 Cl.; 2½ Cr.
A systematic study of significant topographic features of New England and the geological forces and processes involved in their formation. Included for study will be the Boston Basin, the Connecticut River Valley, New England coastal features, the White and Green Mountains.

13.11 Principles of Geology   4 Cl.; 4 Cr.
An introduction to the kinds of evidence on which our present understanding of geology is based. While some consideration will be given to rock classification and landscape morphology, this will be subordinate to a consideration of the physical and chemical forces which interact to form and shape the earth.

13.12 Historical Geology   4 Cl.; 4 Cr.
An examination of the factors that serve the geologist in determining the history of a land mass, and the extent to which these factors have been and can be applied in the field. A survey of the Eras and Periods currently identified with specific reference to the environment that characterized the times, and the forces that provoked the development, persistence, and termination of each time unit.

Mathematics

14.07 Differential Equations   Prep. 14.66; 4 Cl.; 4 Cr.
Elementary theory and solution of ordinary differential equations. Properties of equations and of their solutions. Applied problems. Series solutions.

14.08 Differential Equations   Prep. 14.07; 4 Cl.; 4 Cr.
Methods of solution. Theory of differential equations. Special methods for second and higher order equations and linear equations; algebra of linear operators; Laplace transforms; method of Picard; first- and second-order partial differential equations; existence theorems for first- and nth-order equations and for systems of first-order equations.

14.11 Theory of Equations   Prep. 14.66; 5 Cl.; 2½ Cr.
Theory and analysis of equations and polynomials; continuity; complex numbers; equations of higher degree; discriminants; theorems on roots; fundamental theorem of algebra; symmetric functions.

14.13 Computer Programming   Prep. 14.66; 4 Cl.; 2 Lab.; 2½ Cr.
Introduction to the programming of digital computers; machine languages, interpretive routines, compilers. Study of one language for a specific computer; laboratory exercises in solution of practice problems at the computation center.

14.14 History of Mathematics Prep. 14.66; 5 Cl.; 2½ Cr.
Development of the various branches of mathematics; the lives of men who
have made outstanding contributions to mathematical science; growth of
mathematical knowledge and the development of civilization.

14.15 Advanced Calculus Prep. 14.66; 4 Cl.; 4 Cr.
Theorems on limits and continuity; differentiability; mean-value theorems;
Riemann definite integral; differentiation of integrals; Taylor's formula with
remainder; indeterminate forms.

14.16 Advanced Calculus Prep. 14.15; 4 Cl.; 4 Cr.
Partial differentiation; extrema with constraints; Lagrange's method and
multipliers; Taylor's series for two variables; Jacobians; line integrals; trans-
formation of multiple integrals; improper integrals and Laplace transforms.

14.17 Infinite Series Prep. 14.07; 4 Cl.; 4 Cr.
Limits; infinite series; tests of convergence and divergence; algebraic opera-
tions; integration and differentiation; integration by means of series; applica-
tions and uses of special series; solution of differential equations by series.

14.21 Basic Mathematics I 3 Cl.; 3 Cr.
Stress upon basic mathematical concepts as well as applications. Logical de-
velopment of the real and complex number systems; solution of linear, quad-
ratic, and simultaneous equations.

14.22 Basic Mathematics II Prep. 14.21; 3 Cl.; 3 Cr.
Algebra of sets, permutations and combinations, introduction to probability
and statistics.

14.23 Basic Mathematics III Prep. 14.22; 3 Cl.; 3 Cr.
Elements of analytic geometry, including straight-line, circle, and conic sec-
tions; introduction to differential calculus; fundamentals of trigonometry.

14.28 Mathematical Statistics Prep. 14.66; 4 Cl.; 4 Cr.
Probability theory; basic principles of statistical inference; classification of
data; moments of empirical and theoretical distributions; moment-generating
functions; binomial, Poisson, and normal distributions; random sampling;
testing of hypotheses; empirical linear correlation and regression.

14.29 Mathematical Statistics   Prep. 14.28; 4 Cl.; 4 Cr.

Normal distribution for two variables as a model for correlation and regression; chi-square distribution; confidence interval estimation; students t-distribution; Snedecor's F-distribution; analysis of variance, sampling inspection, sequential analysis, and non-parametric methods.

14.30 Finite Mathematics   Prep. 14.66; 5 Cl.; 2½ Cr.

For Industrial Engineers. Introduction to mathematical logic; analysis of compound statements, truth tables, logical relations. Introduction to the algebra of sets; set functions. Set-theoretic foundations of probability theory. Elementary matrix theory; transition matrices, application to Markov chains.

14.31 Geometries   Prep. 14.66; 4 Cl.; 4 Cr.

Development of various systems of geometry from a common foundation; geometry and calculus of three dimensions. Role of the parallel postulate in the geometry of Euclid and in the non-Euclidean geometries. Space geometry.

14.33 Vector Analysis   Prep. 14.66; 4 Cl.; 4 Cr.

Vector algebra, calculus of vectors, the del operator, line integrals, vector spaces.

14.35 Numerical Analysis   Prep. 14.07; 4 Cl.; 4 Cr.

Methods for the approximate solution of algebraic, transcendental, and differential equations; definite integrals, analysis of tabulated data.

14.37 Abstract Algebra I   Prep. 14.66; 4 Cl.; 4 Cr.

Introduction to modern algebra. Algebra of matrices and canonical forms; groups of transformations; systems of linear equations; linear vector spaces.

14.38 Abstract Algebra II   Prep. 14.37; 4 Cl.; 4 Cr.

Algebraic systems; groups, integral domains, rings, and fields.

14.39 Topics in Set Theory   Prep. 14.66; 5 Cl.; 2½ Cr.

Basic relations and operations for finite and infinite sets. Study of the axiomatic method. Applications to the linear continuum and the real number system.

14.40 General Mathematics   4 Cl.; 4 Cr.

This course is designed to prepare the student to solve mathematical problems which arise in elementary science courses. Topics in algebra will include exponents, logarithms, and graphs. An introduction to descriptive statistics will be presented.

14.41 Fundamentals of Mathematics I   8 Cl.; 4 Cr.

For Business Administration and non-science Liberal Arts students. Basic mathematical concepts and applications. Logical development of number systems; linear, quadratic and simultaneous equations; exponents, radicals, and logarithms; elements of analytic geometry.

14.42 Fundamentals of Mathematics II   Prep. 14.41; 5 Cl.; 2½ Cr.

Algebra of sets; permutations and combinations; probability and statistics; fundamentals of trigonometry.

14.43 Fundamentals of Mathematics III   Prep. 14.42; 5 Cl.; 2½ Cr.
Functions and graphs; introduction to differential and integral calculus with applications.

14.44 Mathematical Principles I   4 Cl.; 4 Cr.
A first course for economics majors. Review of algebra: fractions, powers and roots, equations, logarithms, inequalities. Determinants and matrices, introduction to linear programming.

14.45 Mathematical Principles II   Prep. 14.44; 4 Cl.; 4 Cr.
Fundamentals of trigonometry and analytic geometry; introduction to differential and integral calculus.

14.46 Mathematical Principles III   Prep. 14.45 or 14.23; 4 Cl.; 4 Cr.
Differential calculus; further topics in analytic geometry.

14.47 Mathematical Principles IV   Prep. 14.46; 4 Cl.; 4 Cr.
Integral calculus; brief introduction to differential equations.

14.60 Introduction to Number Theory   Prep. 14.66; 5 Cl.; 2½ Cr.
An introductory study of certain properties of positive integers, including fundamental theorems on divisibility; theory of congruences; quadratic residues; introduction to Diophantine equations.

14.61 Mathematical Analysis I   Prep. 3½ units coll. prep. math; 5 Cl.; 5 Cr.
Introduction to analytic geometry and differential calculus; derivatives of polynomials; product, fraction, and chain rules; limits and continuity; curve sketching; application to maximum and minimum and rate problems.

14.62 Mathematical Analysis II   Prep. 14.61; 5 Cl.; 5 Cr.
Indefinite and definite integral; differentiation and integration of sines and cosines; applications of integral calculus, including area, volume, and arc length.

14.63 Mathematical Analysis III   Prep 14.62; 5 Cl.; 5 Cr.
Differentiation and integration of transcendental functions, methods of integration, determinants, further topics in analytic geometry.

14.64 Mathematical Analysis IV   Prep. 14.63; 5 Cl.; 2½ Cr.
Conic sections, hyperbolic functions, permutations and combinations, introduction to probability and statistics.

14.65 Mathematical Analysis V   14.64; 4 Cl.; 4 Cr.
Polar coordinates, parametric equations, vectors in plane and space, partial derivatives.

14.66 Mathematical Analysis VI   14.65; 4 Cl.; 4 Cr.
Multiple integrals with applications, infinite series, indeterminate forms, complex numbers.

14.67 Mathematical Analysis VII   Prep. 14.66; 4 Cl.; 4 Cr.

An introduction to the numerical solution of engineering problems; computer programming; the use of numerical methods to solve problems in root-evaluation, interpolation, and integration; a study of first order and linear differential equations.

14.68 Mathematical Analysis VIII   Prep. 14.67; 3 Cl.; 3 Cr.

Numerical methods and series solutions for differential equations; boundary-value problems; orthogonality; Sturm-Liouville systems. Introduction to partial differential equations.

14.95, 14.96, 14.97, 14.98 Honors Program   4 Cr. each course

See page 93.

Physics

15.11 General Physics   Prep. 14.23; 4 Cl.; 4 Cr.

A survey of Newtonian mechanics. Methods of measurement, laws of rectilinear motion, uniform circular motion, equations of equilibrium, and mechanics of liquids. Lectures and demonstrations are coupled with problems solvable by algebraic or trigonometric methods only.

15.12 General Physics   Prep. 15.11; 3 Cl.; 3 Lab.; 5 Cr.

A survey of the topics of heat, wave motion, sound and light. Some discussion of the laws of X radiation and radioactivity. Lectures and demonstrations. Problems and laboratory experiments are performed on these topics and those of 15.11.

15.13 General Physics   Prep. 15.12; 3 Cl.; 3 Lab.; 5 Cr.

Electricity and magnetism, introductory electronics, Ohm's Law, induced E.M.F.'s, alternating current, vacuum tubes, and elementary modern physics are discussed. Lectures, demonstrations, problems and laboratory work on these topics.

15.15 Advanced Physics   Prep. 14.66; 3 Cl.; 2 Lab.; 4 Cr.

For chemistry majors only. A brief study of experimental spectroscopy and atomic structures. General optical principles of spectroscopic apparatus, prism spectroscopes and spectrographs, the photographic process, the diffraction grating, types of mounting for the grating; the Bohr-Summerfeld atom, the origin of atomic spectra, the spectra of the hydrogen and sodium atoms; and elementary quantum theory.

15.16 Electricity and Magnetism   Prep. 15.56, 14.08; 3 Cl.; 3 Cr.

Electrostatics, dielectrics, Gauss' Law, solutions of Laplace's equation. Magnetostatics, Ampere's and Faraday's Laws, transients, Maxwell's equations. This course leads to course 15.61.

15.17 Mechanics   Prep. 15.54, 14.66; 4 Cl.; 4 Cr.
Vector analysis, Newton's laws of motion, kinematics and dynamics of parti-
cles, kinetic and potential energy, conservative forces, central forces, moving
co-ordinate systems.

15.18 Mechanics   Prep. 15.17, 14.07; 4 Cl.; 4 Cr.
Kinematics and dynamics of systems of particles and rigid bodies, simple and
compound pendulums, first and second moments, generalized co-ordinates,
Lagrange's equations, small oscillations.

15.26 Modern Physics   Prep. 14.66, 15.56; 4 Cl.; 4 Cr.
Molecular relationships, atomic nature of matter and electricity, corpuscular
nature of radiant energy, quantum mechanics, wave theory of matter, atomic
structure, spectroscopy and X-ray production and measurement.

15.27 Modern Physics   Prep. 15.26; 4 Cl.; 4 Cr.
Atomic spectra, molecular spectra, periodic system, radioactivity, alpha,
beta, and gamma ray spectra, nuclear structure and devices for studying
these phenomena; artificial transmutation processes, fission and cosmic rays.

15.29 Thermodynamics   Prep. 15.18, 14.08; 4 Cl.; 4 Cr.
Simple thermodynamic systems, first law, second law, reversibility and ir-
reversibility, entropy, thermodynamic functions, phase changes, applications
to physics and chemistry, introduction to statistical mechanics.

15.33 Quantum Theory   Prep. 14.08, 15.27; 4 Cl.; 4 Cr.
Breakdown of classical theory, origin of the quantum theory, wave packets
and DeBroglie waves; uncertainty principle; Schrodinger equation; solution
of one-dimensional problems.

15.34 Quantum Theory   Prep. 15.33; 4 Cl.; 4 Cr.
Three-dimensional problems; the hydrogen atom; time independent theory
and application to the helium atom.

15.41 Introduction to Atomic and Nuclear Physics Prep. 14.66, 15.56; 4 Cl.; 4 Cr.
Equivalence of mass and energy; the quantum theory; wave nature of parti-
cles; kinetic theory; atomic structure; periodic system; nuclear structure;
radioactivity; radioactive decay laws, nuclear reactions; cross sections.

15.51 Physics   3 Cl.; 3 Cr.
Simple motion of a particle; Newton's laws; operational concepts of momen-
tum; law of gravitation.

15.52 Physics   Prep. 15.51; 3 Cl.; 3 Cr.
Work; energy; impulse; momentum; conservation laws.

15.53 Physics   Prep. 15.52; 3 Cl.; 3 Cr.
Application of the principles in 15.51 and 15.52 to rigid bodies; fluid mechan-
ics; kinetic theory; heat conduction; isothermal and adiabatic processes.

15.54 Physics   Prep 15.53; 5 Cl.; 2½ Cr.
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15.55 Physics   Prep. 15.54, 14.64; 4 Cl.; 3 Lab.; 5 Cr.
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from the Coulomb's law and field viewpoints, magnetostatics, Faraday's in-
duction law, the Bohr-Summerfeld atom, and the atomic view of electricity.

15.56 Physics   Prep. 15.55; 3 Cl.; 3 Lab.; 4 Cr.
General problem of electromagnetic radiation including spectra, physical and
geometric optics.

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Extends techniques of electromagnetic theory to problems of physical optics.
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Fresnel and Kirchhoff.

15.62 Vibration and Sound   Prep. 15.16, 15.18; 3 Cl.; 3 Lab.; 4 Cr.
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For chemistry majors only. Laboratory course in electronic measurements.
Principles and concepts of modern physics. Each period starts with a discus-
sion of the principle to be studied.

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Introduction to the application of solid state to electronics. Structure of the
solid state, electron emission and semiconductor devices.

15.65 Solid State Physical Electronics   Prep. 15.56, 14.66; 3 Cl.; 3 Cr.
For electrical engineering students. Similar to 15.64 but without laboratory.

15.66 Advanced Electronics Laboratory   Prep. 15.64; 1 Cl.; 3 Lab.; 2 Cr.
Introduction to electronic circuit analysis, power supplies, amplifiers, multi-
vibrators and basic feedback circuits.

15.71 Experimental Physics   Prep. 14.08, 14.27, 15.61; 1 Cl.; 3 Lab.; 2 Cr.
Operation of research tools of modern physics. Experiments on relativity,
atomic structure, elementary particle properties, and on the quantum and
wave aspects of radiation.

15.72 Experimental Physics   Prep. 15.71; 1 Cl.; 3 Lab.; 2 Cr.
Methods of experimental physics discussed with emphasis on design of ex-
periments. Work on the design, construction, and performance of an experi-
ment selected by the student.

15.76 Methods of Theoretical Physics   Prep. 15.29; 4 Cl.; 4 Cr.
Some of the mathematical tools and procedures used in theoretical physics are developed. Vector analysis, matrices, complex variables, transformations, the delta function, special functions, Green's functions, and boundary value problems.

15.95, 15.96, 15.97, 15.98 Honors Program   4 Cr. each course
See page 93.

Physical Education

16.10, 16.11, 16.12 Physical Education   2 Lab.; 0 Cr.
All first-year students are required to take physical education or ROTC. Participation in athletic games and sports. For women there are team and individual sports, dance, and posture improvement. Students wishing to be excused from physical education because of physical handicaps are required to present a petition to the faculty supported by a physician's certificate.

16.13 Anatomy and Physiology   5 Cl.; 5 Cr.
Introduction to the basic concepts of the body as a whole and to the study of osteology (bones), syndesmology (ligaments), and myology (muscles).

16.14 Anatomy and Physiology   5 Cl.; 5 Cr.
Study of the body systems.

16.18 Individual Sports   2 Cl.; 6 Lab.; 2 Cr.
The theory and teaching of such individual and dual activities as badminton, handball, deck tennis, table tennis, tennis.

16.19 Individual Sports   2 Cl.; 6 Lab.; 2 Cr.
A continuation of 16.18.

16.20 Introduction to Physical Education   4 Cl.; 2 Cr.
Introduction and orientation to the profession. Professional preparation, opportunities, the organized profession, its aims, and objectives, and relationships to allied and related fields.

16.21 Principles of Physical Education   4 Cl.; 4 Cr.
Philosophy and principles of physical education based on the biological, physiological, and sociological foundations of physical education.

16.24 Organization and Administration of Physical Education
       Prep. 16.21 or permission; 4 Cl.; 4 Cr.
Administrative problems in the field of physical education. Objectives of physical education program, personnel required, gymnasia, athletic fields and construction and maintenance of these units. Requirements for equipment, arrangements of schedules, coaching, meets, etc. Required of all students electing physical education as a minor field.

16.25 Football   Prep. 16.61 or permission; 4 Cl.; 4 Cr.
Furnishes the students interested in football coaching with a thorough
knowledge of the sport. Consideration of fundamentals, the plays of each
position in the line and backfield, offensive and defensive systems, adapta-
tions to particular situations, training and conditioning, rules and interpreta-
tions, and officiating.

16.26 Track and Field Events   Prep. 16.61 or permission; 4 Cl.; 4 Cr.
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conduct of meets; coaching technique, etc.

16.27 Basketball   Prep. 16.62 or permission; 4 Cl.; 4 Cr.
The course deals with organizing and conducting basketball as a phase of
inter-school competition. Basic fundamentals, techniques and different sys-
tems of individual and team play.

16.28 Baseball   Prep. 16.62 or permission; 4 Cl.; 4 Cr.
Basic techniques in coaching baseball at the high school and college levels.
Individual and team play; fundamentals and strategy.

16.31 Kinesiology   4 Cl.: 4 Cr.
Laws of mechanics as applied to human motion and muscular activities;
application to physical education, sports, and athletics.

16.32 Physiology of Exercise   4 Cl.; 4 Cr.
Interrelationships of body functions and organs, muscular action, and physi-
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16.33 First Aid and Safety   4 Cl.; 2 Cr.
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and civilian defense.

16.34 Personal Health   4 Cl.; 4 Cr.
Principles of healthful personal living; maintenance of health and body
efficiency; their application to interpersonal relations and physical education.

16.35 School and Community Health   Prep. 16.34 or permission; 4 Cl.; 4 Cr.
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health observation of individuals at various school levels, health agencies,
and functions in community sanitation and safety.

16.41 Measurement and Evaluation   Prep. 16.14 or permission; 4 Cl.; 4 Cr.
Use of tests and measurements in physical education; evaluation of objec-
tives, programs, and student achievement through measurement techniques.

16.42 Physical Education for the Atypical

                              Prep. 16.14 or permission; 4 Cl.; 4 Cr.
Considers physical education activities and how they may be modified to
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16.43 Athletic Training   4 Cl.; 4 Cr.
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conduct of athletics.

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16.62 Basketball and Baseball　　　　　　　　2 Cl.; 2 Lab.; 3 Cr.
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16.63 Team Sports (Women)　　　　　　　　1 Cl.; 3 Lab.; 2 Cr.
Techniques of teaching basketball and volleyball.

16.63 Team Sports (Men)　　　　　　　　1 Cl.; 3 Lab.; 2 Cr.
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16.64 Gymnastics I　　　　　　　　　1 Cl.; 3 Lab.; 2 Cr.
Introduction to tumbling and apparatus techniques.

16.65 Gymnastics II　　　　　　　　　1 Cl.; 3 Lab.; 2 Cr.
Intermediate tumbling and apparatus techniques.

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Introduction to weight training, boxing, wrestling, and combative games.

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The basic skills and teaching techniques of wrestling.

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16.84 Modern Dance I (Women)   1 Cl.; 3 Lab.; 2 Cr.
Introduction to modern dance techniques and composition.

16.85 Modern Dance II (Women)   1 Cl.; 3 Lab.; 2 Cr.
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An introduction to the nature of science and how it develops, with illustrations drawn largely from the history of astronomy. Geometric optics and the laws of motion are considered when discussing Kepler, Galileo and Newton.

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Atomic chemistry and physics are introduced to provide a background for physical optics and spectral analysis in the understanding of modern astronomical ideas. Problems of cosmology are developed to summarize this unit.

17.03 Survey of Physical Science   3 Cl.; 3 Cr.
Chemical combination, with emphasis on silicon and its role in the formation of minerals and rocks, is followed by an introduction to the surface features of the earth and the forces that cause and shape them.

17.04 Survey of Physical Science   4 Cl.; 2 Cr.
The atmosphere is identified in structure and composition and the development of the concept of air in masses begins with a study of the behavior of an ideal gas. Air masses are discussed in terms of their normal characteristics and behavior, radical forms, the creation of weather sequences, and their importance in forecasting the weather.

17.11 Introduction to Natural History   3 Cl.; 3 Cr.
Animals of the seashore, spiders, insects, amphibians, and reptiles. Identifying characteristics, life history, ecological relationships, and economic importance of specific animals in each group.

17.12 Introduction to Natural History   3 Cl.; 3 Cr.
Fish, birds, and mammals complete the study of the animal kingdom. The natural history of algae, fungi, mosses, ferns, and higher plants.

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A thorough introduction to the night sky as seen by the naked eye and with simple optical aids. The study will include the location and identification of constellations, major stars, planets, comets and meteors. Three (optional) telescopic viewing sessions will be held.

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An introduction to the geology of the ocean basins, and the physical and chemical properties of sea water. Special attention will be given to the development of ocean currents and the important effects these currents have on the land masses of the world.

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20.02 International Economic Geography   Prep. 20.01; 3 Cl.; 3 Cr.
Resources and institutions of the countries of the world, including regional aspects and underdeveloped areas.

20.04 Introduction to Economics   3 Cl.; 3 Cr.
Primarily an institutional approach. Survey of basic economic aspects — national income, business organization, labor, the banking system, etc.

20.06 Principles and Problems of Economics   4 Cl.; 4 Cr.
Introduction to economic theory and problems. Business cycles, money and banking system, fiscal policy, economic growth, fluctuations in national income.

20.07 Principles and Problems of Economics   4 Cl.; 4 Cr.
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For engineering students. A survey of basic economic principles. The structure of the American economy, money and banking system, production, pricing and distribution in a competitive economic system.

20.12 Economics   3 Cl.; 3 Cr.
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Fundamental laws and principles of economic analysis. Price theory, basic concepts of income distribution. Offered during summer term.

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Introduction to basic principles of management science. Use of linear programming in solution of business problems. Introduction to principles of stimulation, queuing theory, and statistical decision-making.

20.95, 20.96, 20.97, 20.98 Honors Program   4 Cr. each course
See page 93.

Education

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Introduction to theory, forms and processes of public administration.

22.21 Public Administration: Selected Problems   Prep. 22.20; 4 Cl.; 4 Cr.
Case study approach to examination of the relations between theory and practice of public administration.

22.22 International Law   Prep. 22.17; 4 Cl.; 4 Cr.
Territory and jurisdiction of states; treaties; recognition; peaceful settlement of disputes; resort to force.

22.23 American Foreign Policy   Prep. 22.52; 4 Cl.; 4 Cr.
Formulation and conduct of foreign policy; role of the United States in world politics since 1945.

22.24 American Political Thought I   Prep. 22.18; 4 Cl.; 4 Cr.
Development of American political ideas from the colonial period to 1850.

22.25 American Political Thought II   Prep. 22.24; 4 Cl.; 4 Cr.
Development of American political ideas from 1850 to the present.

22.26 Introduction to Law   Prep. 22.43; 4 Cl.; 4 Cr.
An introduction to the theory and philosophy of law, the historical foundations of the common law, and legal methods.

22.29 The United States and the Far East   Prep. 22.43; 4 Cl.; 4 Cr.
Relations of the United States with Far Eastern governments with emphasis upon Japan, China, and India since 1945.

22.30 Soviet Foreign Policy   Prep. 22.43; 4 Cl.; 4 Cr.
Role of the Soviet Union in world politics from 1917 to the present.

22.31 The Politics of Africa   Prep. 22.11; 4 Cl.; 4 Cr.
A study of the domestic and international problems of Africa and their
import for United States foreign policy.

22.41 Introduction to Political Science I   3 Cl.; 3 Cr.
Principles, forms, and functions of government in democratic and authori-
tarian societies.

22.42 Introduction to Political Science II   3 Cl.; 3 Cr.
Structure and dynamics of the legislative, executive, and judicial branches of
American national government; political parties and pressure groups; civil
liberties.

22.43 Introduction to Political Science III   3 Cl.; 3 Cr.
American foreign policy; world political forces; the United Nations.

22.51 American National Government I   Prep. 22.43; 4 Cl.; 4 Cr.
The Constitution; problems of federalism; the courts and civil liberties.

22.52 American National Government II   Prep. 22.51; 4 Cl.; 4 Cr.
Congress; the presidency; selected problems in national administration.

22.95, 22.96, 22.97, 22.98 Honors Program   4 Cr. each course
See page 93.

History

23.01 Western Civilization   4 Cl.; 4 Cr.
The foundation of western civilization to the 12th century, with an exami-
nation of Greek and Roman backgrounds; the Judeo-Christian heritage,
feudalism and manorialism, and the relations of church and state.

23.02 Western Civilization   4 Cl.; 4 Cr.
A continuation of Western Civilization to the 16th century, with emphasis on
commercial, intellectual, and political awakenings; the influence of the
Papacy; and the Renaissance and Reformation.

23.03 Western Civilization   4 Cl.; 4 Cr.
The third part of a Western Civilization survey, carrying the story to the
middle of the 19th century, with an analysis of Prussia, Russia, France, and
England; the French Revolution; Napoleon and reaction; and the Industrial
Revolution.

23.04 Western Civilization   4 Cl.; 4 Cr.
The concluding section of Western Civilization, comprising the history of the
past century, with emphasis on the unification of Italy and Germany; World
War I; the ideological struggles between the wars; World War II and the
Cold War.

23.05 Recent American History　　　　　　　　6 Cl.; 3 Cr.
The United States in the 20th century, with emphasis on political, social, and economic characteristics of the major chronological periods: Progressivism, World War I, the 1920's, the New Deal, World War II, and mid-century. (Not open to students who intend to receive credit for 23.18, 23.34, 23.35.)

23.07 Soviet Russia　　　　　　　　　　　　4 Cl.; 4 Cr.
Forces which molded and continue to mold Soviet Russia. Social, economic, and intellectual factors in close correlation with important political developments.

23.09 Ancient Greece　　　　　　　Prep. 23.01; 4 Cl.; 4 Cr.
Origins and development of Greek civilization; political evolution of Hellenistic society from tribal to city-state organization; growth and application of Greek religious, political, and ethical ideas.

23.10 Ancient Rome　　　　　　　　Prep. 23.01; 4 Cl.; 4 Cr.
Roman civilization in two sequences; the rise of Roman power under the Republic; the decline of Roman power under the Empire. Social, economic, intellectual, and religious expressions of each sequence.

23.11 Eighteenth-Century Europe (1700-1815)　　　4 Cl.; 4 Cr.
Europe in the Age of Enlightenment, when concepts were advanced which produced sweeping changes in government and society. French Revolutionary era and its impact on European thought and institutions.

23.12 Nineteenth-Century Europe (1815-1914)　　　4 Cl.; 4 Cr.
Europe during a century of dramatic transformation. The post-Napoleonic reaction, the Industrial Revolution. Liberalism, Socialism, Nationalism, the rise of imperialism, and the diplomatic background of World War I.

23.13 England to 1688　　　　　　　　　　4 Cl.; 4 Cr.
Prehistoric Britain, the Normans, Tudor absolutism, and the Stuarts through the Glorious Revolution.

23.14 England since 1688　　　　　　　　　4 Cl.; 4 Cr.
Decline of the monarchy; Industrial Revolution; reaction and reform in the 19th century; world wars and Socialist Britain.

23.16 American Constitutional History　　　　　4 Cl.; 4 Cr.
Historical development of the Constitution of the United States, with particular emphasis on its progressive adjustment to the changing social and economic order.

23.17 The United States to 1865　　　　　　　4 Cl.; 4 Cr.
A survey of the history of the United States from 1783 to 1865, with an analysis of the major political, diplomatic, economic, and social problems of the new nation.

23.18 The United States since 1865　　　　Prep. 23.17; 4 Cl.; 4 Cr.
A continuation of the survey of American history, with discussion of the emergence of an industrial economy, an urban society, world responsibility, and expanded federal government.

23.19 Latin America to 1826   4 Cl.; 4 Cr.
The fusing of the cultures of the Indian, the Iberian, and the Negro. The forces, both European and American, which gave rise to the Latin American War for Independence.

23.20 Latin America since 1826   4 Cl.; 4 Cr.
Rise of the great nations of Latin America; caudillism; struggles toward democracy. Particular emphasis on relations between the U.S. and Latin America.

23.21 History of Mexico   5 Cl.; 2½ Cr.
Background of modern Mexico, emphasizing events since the Revolution of 1910 and relations with the United States.

23.24 Imperial Russia   4 Cl.; 4 Cr.
Emergence of Russia as a recognized European power. Westernization and expansion of the 18th century, merging into the Napoleonic era and age of reaction. Reform, its failure, and the attendant revolutionary movements leading into the 20th century, and the last of the Romanovs. Social, economic, and intellectual factors.

23.32 Colonial America   4 Cl.; 4 Cr.
America from the Age of Exploration to the close of the American Revolution. Emphasizes the interaction of European heritage and American wilderness, and the rise of America's desire to be free.

23.33 The Westward Movement   4 Cl.; 4 Cr.
America's westward movement in the 19th century, and its impact on the ideological, economic and cultural life of the nation.

23.34 Progressivism, War and Reaction   4 Cl.; 4 Cr.
American people in sharply contrasting moods in one generation. From imperialism to isolationism; from liberalism to reaction. (Not open to students who intend to receive credit for 23.05.)

23.35 The New Deal, World War II and Its Aftermath   4 Cl.; 4 Cr.
From isolation to world leadership; New Deal to the return of the conservatives. (Not open to students who intend to receive credit for 23.05.)

23.38 Modern Middle East   4 Cl.; 4 Cr.
The Middle East from 1914 to the present; the rise of Nationalism, Zionism, and Pan Arabism; the effects of the two world wars and the postwar settlements; the impact of oil; the changing culture of the Middle East.

23.39 American Historians   5 Cl.; 2½ Cr.
The literature of American History. Major writers from the colonial period to the present, with emphasis on the changing nature of form and substance.

23.40S Modern Africa   5 Cl.; 2½ Cr.
European imperialism and the partition of Africa in the 19th century; colonial policies and the rise of African nationalism; the emergence of independent African states.

23.43 Modern Europe   4 Cl.; 4 Cr.
Europe since 1914; World War I; the rise of Communism and Fascism and
their impact; the struggle for stability and social justice in the western
democracies; World War II; the Cold War. (Not open to students who intend
to receive credit for 23.52.)

23.44 The British Empire   4 Cl.; 4 Cr.
A study of 19th-century imperialism, British colonial policy, and the evolu-
tion of the British Empire into the Commonwealth of Nations, with special
emphasis on the history of important Commonwealth countries.

23.45 Stuart England   Prep. 22.13; 4 Cl.; 4 Cr.
England from 1643 to 1688, with emphasis on the origins of modern Liberal-
ism and social and economic change.

23.46 Studies in American History 1825-1850   Prep. 23.17; 4 Cl. 4 Cr.
An intensive analysis of the political, economic, and social life in the quarter
century that witnessed Jacksonian democracy, expansionism, and the de-
velopment of sectional differences.

23.47 Studies in American History 1876-1896   Prep. 22.18; 4 Cl.; 4 Cr.
An intensive analysis of the two decades when America emerged from the
Reconstruction and prepared for the 20th century.

23.48 Political and Economic History of the Early Middle Ages   4 Cl.; 4 Cr.
Europe from the decline of the Roman Empire to 1215; the development of
Christianity and the expansion of the Church to Innocent III; the conflict
of Pope and Holy Roman Emperor; the rise and extension of feudalism and
manorialism; the growth of trade and towns.

23.49 Social and Cultural History of the Early Middle Ages   4 Cl.; 4 Cr.
European society and thought from the decline of the Roman Empire to the
14th century; the disappearance of Roman institutions and their replace-
ment by Christian culture; the German migrations; the Christian philosophers
and theologians; the changing patterns of art and architecture.

23.50 The Rise of the Nation States 1300-1700   4 Cl.; 4 Cr.
The political and economic life of Europe from the 14th to the 18th century;
monarchy and constitutional government; the growing conflict between
church and state; the growth of capitalism and international trade.

23.51 The Renaissance and Reformation   4 Cl.; 4 Cr.
European culture from the 13th to the 17th century; the decline of the
Church and the rise of Protestant sects; Humanism; the rebirth of classicism
in literature and the arts; the cultural and social consequences of religious
wars.

23.52 Contemporary Europe   3 Cl.; 3 Cr.
Europe in the 20th century, with emphasis on the background of contempo-
rary problems. Special consideration of historical implications of Fascism,
Capitalism, Socialism, and Communism. (Not open to students who intend
to receive credit for 23.43.)

23.53 The Formative Period: The United States 1781-1815
Prep. 23.17; 4 Cl.; 4 Cr.

The political, economic, and psychological problems of adjustment to peace and independence at the end of the Revolution; constitutional, political, cultural, and economic developments in the United States from the end of the Revolution to the War of 1812.

23.54 The Era of the Civil War: The United States 1850-1877
Prep. 23.17, 23.18; 4 Cl.; 4 Cr.

The sectional controversies of the 1850's and the causes of the Civil War; the effects of the Civil War upon American society; the impact of Reconstruction upon whites and Negroes. The military history of the Civil War will not be treated at length.

23.55 Victorian England
Prep. 23.14; 4 Cl.; 4 Cr.

The political, economic, and social life of the English people during Victoria's reign.

23.90 The Historian's Craft
4 Cl.; 4 Cr.

A discussion of the ways in which the historian studies the past and the nature of historical statements. Problems considered include research techniques, changing conceptions of historical knowledge, and the relationship between the historian and the society in which he works.

23.95, 23.96, 23.97, 23.98 Honors Program
4 Cr. each course

See Page 93.

Philosophy and Religion

24.01 Introduction to Philosophy
4 Cl., 4 Cr.

What philosophy is, its relation to other subjects, its uniqueness, its chief fields, its systems and schools of thought, its essential problems, its proposed solutions to man's quest for truth and meaning in life.

24.02 Problems of Philosophy
Prep. 24.01; 4 Cl.; 4 Cr.

Is reality mental or physical, or both — or even more than mind and matter? How do we know that we know? What are values and what values are most important? What determines our destiny and how free are we? What do philosophers think about God and immortality?

24.03 History of Philosophy
4 Cl.; 4 Cr.

Greek philosophers just before Plato's time. Ideas of Socrates, Plato, and Aristotle among the Greeks. Neo-Platonic, patristic, and scholastic periods.

24.04 History of Philosophy
Rep. 24.03; 4 Cl.; 4 Cr.

Natural science era, emphasis upon Francis Bacon and Descartes. The Enlightenment, dealing especially with Locke and Berkeley. The idealistic period beginning with Kant.

24.06 Introduction to Logic 4 Cl.; 4 Cr.
Formal principles of correct and incorrect argument, meaning and significance of language, and the fundamental principles of scientific methods. Practical exercises in effective argument, correct procedures of inference, and clearer verbalization.

24.10 Social Philosophy 4 Cl.; 4 Cr.
Influential conceptions as to character, structure, and function of society. Principles, means, and goals which underlie these major conceptions. Emphasis on Plato, Aristotle, Hobbes, Locke, Rousseau, and Marx.

24.11 Twentieth-Century Philosophy Prep. 24.04; 4 Cl.; 4 Cr.
Important trends in philosophical thought in the last sixty years. Emphasis on Bergson, Whitehead, Heidegger, Dewey, and Ayer.

24.13 Ethics 4 Cl.; 4 Cr.
Nature and importance of ethics. Its relation to philosophy, psychology, sociology, and religion. Origins of morality. Views of human nature. Standards for morality: authoritarianism, naturalism, intuitionism, formalism, hedonism, relativism, and self-realization. Ethics in business and the professions.

24.14 Ethics 4 Cl.; 4 Cr.
Continuation of 24.13.

24.16 Philosophy of Science 4 Cl.; 4 Cr.
Ideals, presuppositions, methods, and values which various writers have thought characteristic of science. Relations between science and philosophy. What logicians and metaphysicians have had to say about science and scientific method.

24.40 Elements of Philosophy 3 Cl.; 3 Cr.
Nature and spirit of philosophy. Its relation to science, literature, and religion. Main systems and the great ideas among philosophers. How philosophy applies to daily experience and its suggested answers to the perennial questions encountered by the thinking person.

24.41 Problems of Philosophy Prep. 24.40; 3 Cl.; 3 Cr.
Continues the principal questions raised in 24.01. Attention to problems in the philosophy of religion and the relationships between the great religions of the world.

24.42 Foundations in Ethics Prep. 24.41; 6 Cl.; 3 Cr.
Right and wrong, good and evil, obligation and mature moral responsibility. Nature of value judgments. Chief schools of ethical thought. Questions of freedom of choice, basic values, and recent trends.

24.50 Introduction to Religion 4 Cl.; 4 Cr.
The nature of religion. Its relation to myth, magic, science, philosophy, and theology. Varieties of religious experience. Tests for validity. Basic attributes of God or gods. Changing patterns in religious thought.

24.51 The Great Religions   4 Cl.; 4 Cr.
Comparative study of beliefs and contributions of the great religions of the modern world. Emphasis on the Eastern religions.

24.52 The Religions of the United States   4 Cl.; 4 Cr.
Judaeo-Christian beliefs and practices. Catholicism of both Western and Eastern rites, the three main branches of Judaism, and denominations within Protestantism.

24.53 Contemporary Trends in Religion   4 Cl.; 4 Cr.
Trends toward unity as well as toward separatism. Effects of secularism and Communism. The conservative-liberal tensions. Religious reawakening. Influences of Eastern religions, especially Zen Buddhism. Indications of the role of religion in the future decade.

24.55 Philosophy of Religion   4 Cl.; 4 Cr.
What is religion? What are the basic conceptions about God? What are the arguments proposed in favor of, as well as against, belief in deity? What about the problem of natural and moral evil? What about the various beliefs in immortality? What about a world religion?

Psychology

25.01 Introductory Psychology   4 Cl.; 4 Cr.
Major concepts from most areas of psychological investigation. The experimental approach to the study of behavioral data, including growth and development, learning, perception, and motivation.

25.02 General Psychology   Prep. 25.01; 4 Cl.; 4 Cr.
The sensory basis of response, individual and group differences, mental testing, attitude formation, and personal adjustment.

25.04S Social Psychology   Prep. 25.02; 5 Cl.; 2½ Cr.
The relationship of man to the group; a study of his patterned social behavior, morale, customs and myths, institutions, and conscious and unconscious motives and motivation.

25.06S Psychology of Adjustment   5 Cl.; 2½ Cr.
A beginning course devoted to problems and principles of adjustment to life. May not be substituted for 25.01 or 25.02.

25.07 Psychology   6 Cl.; 3 Cr.
The wide and varied interests, efforts, pursuits and problems of psychology and psychologists. Growth and development, motivation, individual differences, measurement, statistical concepts, psychology of sensation and perception.

25.08 Psychology   Prep. 25.07; 6 Cl.; 3 Cr.
The psychology of group behavior, personality development, and integration.

25.09 Statistics in Psychology   Prep. 25.02; 4 Cl.; 4 Cr.
Scales of measurement, graphs, measures of central tendency and variability, and correlation.

25.10 Statistics in Psychology   Prep. 25.09; 4 Cl.; 4 Cr.
Probability, binomial and normal distributions, estimation, and parametric and non-parametric tests of significance, including chi square, t-test, F test, sign test, median test, simple analysis of variance.

25.11 Individual Differences   Prep. 25.02; 4 Cl.; 4 Cr.
Scientific principles basic to the investigation of human differences. History of the field, techniques which have evolved, and the bearing which this field has upon special disciplines within psychology.

25.12 Experimental Psychology (Conditioning and Learning)
                    Prep. 25.27; 3 Cl.; 3 Lab.; 4 Cr.
A systematic experimental study of the methods and techniques for investigating conditions of learning, and the relation of conditioning to learning theory. Experiments will be performed on animal and human subjects.

25.21 Child and Adolescent Psychology   Prep. 25.02; 4 Cl.; 4 Cr.
Detailed exploration of the processes of growth and development from infancy through adolescence. Consideration of such topics as sensory and motor development, social development, social behavior, intelligence, language, and personality, with emphasis upon characteristic patterns and problems.

25.22 Psychological Testing   Prep. 25.09; 4 Cl.; 4 Cr.
Basic principles of test theory, test administration, and test construction. Familiarization with representative types of tests.

25.23 Intelligence Testing   Prep. 25.22; 4 Cl.; 4 Cr.
Administration, scoring, and interpretation of individual intelligence tests. Supervised practice in the Wechsler Scales (WAIS and WISC) and the Stanford Binet L-M, 1960 Revision.

25.25 Motivation   Prep. 25.02; 4 Cl.; 4 Cr.
Survey of the various aspects of motivation. Such areas as primary and secondary reinforcement, unconscious motivation, effectance motivation, and the assessment of motives will be considered.

25.27 Experimental Psychology (Research Methods)
                    Prep. 25.10; 3 Cl.; 3 Lab.; 4 Cr.
Concentration upon the experimental method in the design, execution, analysis, and reporting of psychological experiments. Laboratory investigations are conducted to illustrate the facts, principles, and theories of general experimental psychology.

25.28 Experimental Psychology (Sensation and Perception)
                    Prep. 25.27; 3 Cl.; 3 Lab.; 4 Cr.
Structure and function of the sense organs. Methods of investigating the sensory processes of vision, hearing, olfaction, taste, and the skin senses. Behavioral analysis of the perception of form, color, and space.

25.29 Psychology of Personality   Prep. 25.02; 4 Cl.; 4 Cr.
Systematic study of the normal personality. A number of approaches to personality research will be considered, including the Freudian, neo-Freudian, Lewinian, stimulus-response, factor analytic, and constitutional.

25.31 Abnormal Psychology   Prep. 2 yrs. of psychology; 4 Cl.; 4 Cr.

Study of the abnormal personality. Historical and cross-cultural views of behavioral normality and abnormality. Anxiety and defense. Etiology, dynamics, and symptomatology of the neuroses.

25.32 Abnormal Psychology   Prep. 25.31; 4 Cl.; 4 Cr.

Psychotherapy. Etiology, dynamics, and symptomatology of the psychoses. Psychosomatic, psychopathic, and organic disorders. Somatic therapies. Socio-cultural aspects.

25.33 Social Psychology   Prep. 25.02; 4 Cl.; 4 Cr.

The analysis of the individual's behavior in social contexts. Topics considered include the historical development of social psychology, socialization, national character, ethnic and class structure, prejudice, psycholinguistics, attitudes and attitude measurement, propaganda, crowd behavior, group membership and structure, leadership, and social movements.

25.38 Physiological Psychology   4 Cl.; 4 Cr.

The central and peripheral nervous systems, nerve physiology, and the internal environment. The physiological psychology of vision, hearing, olfaction, taste, and the skin senses. (Permission of the instructor required.)

25.39 Physiological Psychology   Prep. 25.38; 4 Cl.; 4 Cr.

Physiological factors in the study of emotion, motivation, instinctive behavior, learning, problem-solving, and language.

25.41 History of Psychology   Prep. 2 yrs. of psychology; 4 Cl.; 4 Cr.

Current status of psychology among the sciences in the light of its history.

25.42 Systems of Psychology   Prep. 25.41; 4 Cl.; 4 Cr.

Major schools of psychology which have influenced the development of modern psychology. Contemporary systematic trends and their historical development.

25.51 Industrial Psychology   Prep. 25.02; 3 Cl.; 3 Cr.

Psychological techniques in the selection and placement of employees, use of psychological tests in industry, and the evaluation of the human factors leading to optimal working efficiency and job satisfaction.

25.61, 25.62 Directed Study   (Credit to be arranged.)

Independent study under the direction of a member of the department.

25.71, 25.72, 25.73, 25.74 Seminar in Psychology   2 Cl.; 1 Cr. each course

Discussion of current problems in psychology.

25.95, 25.96, 25.97, 25.98 Honors Program   4 Cr. each course

See page 93.

Art

27.01 Ancient Art 4 Cl.; 4 Cr.
Materials and techniques employed by ancient artisans in architecture, sculpture, and painting. A survey of prehistoric art and the arts of ancient Egypt, Mesopotamia, Crete, and Greece.

27.02 Early Christian and Medieval Art 4 Cl.; 4 Cr.
Roman, Early Christian, Byzantine, Romanesque and Gothic art.

27.03 Italian Renaissance Art 4 Cl.; 4 Cr.
Renaissance architecture, sculpture, and painting.

27.04 European Art 4 Cl.; 4 Cr.
The Baroque period of art and the European Renaissance period. Architecture, sculpture, painting, and the graphic arts up to the end of the 19th century.

27.05 Modern Painting 4 Cl.; 4 Cr.
This course traces the stylistic and historical development of painting from the late 19th century to the present.

27.08 American Art I 4 Cl.; 4 Cr.
Development of American architecture, sculpture, and painting, from colonial times to about 1860.

27.09 American Art II 4 Cl.; 4 Cr.
American architecture, sculpture, and painting 1860 to the present.

27.21 Foundations of Western Culture 4 Cl.; 4 Cr.
The early world and ancient man; the ancient civilizations of Mesopotamia, Egypt, Palestine, Crete, and Greece. The Hellenistic World.

27.22 Foundations of Western Culture Prep. 27.21; 4 Cl.; 4 Cr.
Rome; the Early Christian and Byzantine periods; the Moslem World; European invasions; the Feudal Age and the Crusades.

27.23 Foundations of Western Culture Prep. 27.22; 4 Cl.; 4 Cr.
Medieval religion, education, science, and the arts; the Gothic Age; the emergence of nations; the Renaissance; European religious conflicts and the Age of Exploration and Discovery.

27.24 Foundations of Western Culture — American Prep. 27.23; 5 Cl.; 2½ Cr.
A study of our European heritage and the development of American culture from colonial times to the 19th century.

27.30 Elementary Drawing and Lettering 2 Cl.; 4 Lab.; 4 Cr.
Elementary mechanical drawing problems, Gothic, Roman, and Script lettering, and tracings in ink.

27.31 Pictorial Drawing Prep. 27.30; 2 Cl.; 4 Lab.; 4 Cr.
Isometric, oblique, and cabinet drawings, mechanical perspective, and industrial production illustration.

27.32 Creative Drawing   6 Lab.; 4 Cr.
The student will execute creative drawing problems in pen and ink, pencil, charcoal, crayon, and chalk, that will offer experience in drawing form and texture. Solution of problems in black and white for commercial design.

27.33 Theory of Color and Design I   6 Lab.; 4 Cr.
Techniques and theories of design and composition in commercial art and creative painting. Students will execute color compositions in water color and chalk.

27.34 Theory of Color and Design II   Prep. 27.33; 6 Lab.; 4 Cr.
Problems in landscape and still life painting, costume figure composition, and illustration, including book jacket design and portraiture.

27.40 Ancient Art and Architecture   3 Cl.; 3 Cr.
Prehistoric art and the art and architecture of Egypt, Mesopotamia, Crete, Greece, and Rome.

27.41 Medieval and Renaissance Art and Architecture   3 Cl.; 3 Cr.
Early Christian, Byzantine, Romanesque, Gothic, and Italian Renaissance art, with particular emphasis on the development of architecture.

27.42 Renaissance and Modern Art and Architecture   6 Cl.; 3 Cr.
Renaissance painting and the architectural developments in Europe and America from the Baroque period to contemporary times.

Drama, Speech, and Music

Music

28.01 Music Appreciation   4 Cl.; 4 Cr.
Representative works from the standard repertory are analyzed with emphasis on listening to music creatively.

28.03 Music Fundamentals   4 Cl.; 4 Cr.
Basic facts concerning tone relationships, music notation, and elementary chord structure.

28.04 Musical Forms   Prep. 28.01; 4 Cl.; 4 Cr.
Common musical forms such as the sonata, theme and variations, and rondo. Emphasis on hearing the formal structure of the composition.

28.05 The Classical Symphony   Prep. 28.01, 28.03; 4 Cl.; 4 Cr.
Structural development of the symphonic form during the classical period. Significant symphonies of Haydn, Mozart, and Beethoven.

28.07 Introduction to Opera   4 Cl.; 4 Cr.
Survey of important opera scores from Don Giovanni to the present.

28.12 Music Masterpieces before 1750   5 Cl.; 2½ Cr.
Important musical developments from the plain chant era through the Baroque. Recordings of various works from individual scores.

28.14 Music in the Romantic Era 4 Cl.; 4 Cr.
Representative score by such composers as Schubert, Schumann, Berlioz, Chopin, and Wagner are analyzed to follow the development of the Romantic Movement in music.

28.15 Chamber Music Prep. 28.01; 4 Cl.; 4 Cr.
From duets to octets, from Mozart to Milhaud, this survey will cover scores of some of the most intensive and serious creations in the mainstream of Western Music.

28.20 American Music Prep. 28.01; 4 Cl.; 4 Cr.
The development and emergence of an "American" school in composition.

28.40 Introduction to Music 3 Cl.; 3 Cr.
Major and minor scales and basic chord relationships; melody, harmony, counterpoint, and rhythm. A short history of music to 1300.

28.41 Musical Forms 3 Cl.; 3 Cr.
The fugue, the sonata, theme and variations, and the lied. Analysis of the symphony, the string quartet, the opera, and the tone poem.

28.42 Contemporary Music 6 Cl.; 3 Cr.
Special styles of composition such as the 12-tone technique, the neo-classic, the neo-romantic, and the impressionistic.

Speech and Drama

29.01 Public Speaking 3 Cl.; 3 Cr.
Study and practice of basic principles and techniques of effective modern speaking. Emphasis on conversational delivery and clear, concise composition through group procedures, impromptu speaking, and the handling of short expository forms.

29.02 Public Speaking Prep. 29.01; 3 Cl.; 3 Cr.
Speech patterns which involve effective discussion; analysis, evidence, and reasoning as factors in convincing and persuading people.

29.03 Effective Speaking 3 Cl.; 3 Cr.
Fundamentals of speaking, conferring, and reporting. The class is organized as a functional group with officers and agenda.

29.06 Introduction to Speech 4 Cl.; 4 Cr.
An analysis of the scientific aspects of oral communication. The development of speech, the mechanisms of respiration, phonation, resonance, and articulation, and the symptomatology of speech deviations: brain-damaged speech behavior, articulation, voice, and rhythm.

29.11 Comparative Drama 4 Cl.; 4 Cr.
Development of the theatre and the drama of Greece and Rome, medieval Europe, Elizabethan and Restoration England, and 17th-century France.

29.12 Comparative Drama 4 Cl.; 4 Cr.
Development of European and American theatre of the 18th, 19th, and 20th

centuries. Growth and development of the proscenium theatre, the emphasis upon naturalistic and realistic presentation, and the theatre innovations.

29.13 Contemporary Theatre 5 Cl.; 2½ Cr.
New trends in composition and staging for the present-day theatre.

29.14 American Drama 5 Cl.; 2½ Cr.
A survey of the American theatre from the Revolutionary War to the present.

29.21 Play Production 4 Cl.; 4 Cr.
Principles which underlie theatre practice and theatre technique; selecting the play; analyzing the script; determining the style of production; designing the floor plan and the setting; planning the stage movement; designing the properties, the costumes, the make-up, the lighting; co-ordinating the work of the production staff; planning the budget.

29.22 Rehearsal and Performance Prep. 29.21; 4 Cl.; 4 Cr.
Mounting a play for production. The function of the director, the director's relationship with his associates, the conduct of rehearsals, the purpose and methods of acting, and the conduct and evaluation of performance.

29.30 Playwriting 4 Cl.; 4 Cr.
The elements and structure of drama. The writing of a one-act play.

29.31 Seminar in Comedy Prep. 29.11, 29.12; 4 Cl.; 4 Cr.
Study of the Comic Spirit and its manifestations in dramatic literature. The development of comic playwriting from Aristophanes to the present. The nature of farce, comedy, satire, parody.

29.32 Seminar in Tragedy Prep. 29.11, 29.12; 4 Cl.; 4 Cr.
The nature of tragedy. Ancient and modern attitudes toward the problem of tragedy. A study of the dramatic theories of Johnson, Coleridge, Bradley, Eliot, Krutch, Bentley.

English

30.01 English 3 Cl.; 3 Cr.
A review of basic sentence structure, punctuation, and the principles of paragraphing. Theme assignments develop skill in expository writing. Related readings.

30.02 English Prep. 30.01; 3 Cl.; 3 Cr.
Structure, organization, and preparation of student reports. Theme assignments develop skill in research and argumentation. Related readings.

30.03 English Prep. 30.02; 3 Cl.; 3 Cr.
Problems peculiar to description and narration as related to the short story. Theme work also includes the writing of business letters and literary critiques.

30.04 Introduction to Literature 5 Cl.; 2½ Cr.
Aims and techniques of drama and poetry. The writing of short critical reports.

30.15 Literature   3 Cl.; 3 Cr.
Five Shakespearean plays are read and discussed with special attention to character, motivation, situation, and adaptation to the Elizabethan stage.

30.16 American Literature   3 Cl.; 3 Cr.
Outstanding works in American literature in their relation to social and intellectual backgrounds.

30.19 Shakespeare Plays   5 Cl.; 2½ Cr.
A study of the history plays, with emphasis on character, plot, and significance to modern readers.

30.21 Intermediate Writing   4 Cl.; 4 Cr.
Writing of the shorter forms of composition. Students' manuscripts are read and analyzed.

30.22 Intermediate Writing   Prep. 30.21; 4 Cl.; 4 Cr.
Writing of the shorter forms of composition, both prose and poetry, continued. The student is expected to complete approximately 9,000 words of manuscript.

30.24 Advanced Composition   4 Cl.; 4 Cr.
Preparation of manuscripts for publication.

30.29 Foundations of the English Language   4 Cl.; 4 Cr.
Development of English out of and alongside other languages. Some principles of linguistic science.

30.30 Foundations of the English Language   Prep. 30.29; 4 Cl.; 4 Cr.
Influence of accent. English in its larger elements, informative and symbolic uses of it, with some of the implications of semantics.

30.31 Western World Literature.   4 Cl.; 4 Cr.
A survey of major literary forms in the European tradition, especially the epic, dialogue, and drama. Readings will include selections from the work of Homer, Virgil, Dante, the Greek dramatists, and Plato.

30.32 Western World Literature   4 Cl.; 4 Cr.
A survey of major literary forms in the European tradition, especially drama and the novel. Readings will include selections from the work of Racine, Marlow, Goethe, Cervantes, Dostoevsky, and Melville.

30.33 Survey of English Literature   4 Cl.; 4 Cr.
Broad survey of English literature to 1800 intended to give the student an appreciation of English literature.

30.34 Survey of English Literature   4 Cl.; 4 Cr.
Survey of English literature from 1800 to the present century. The writers who contributed most to the development of modern literature in England.

30.35 American Literature to 1860   4 Cl.; 4 Cr.
American literature from colonial times to the triumph of the transcendental movement in New England.

30.36 American Literature after 1860 Prep. 30.35; 4 Cl.; 4 Cr.
Rise of realism after the Civil War; development of American humor; appearance of local color writers; modern trends since 1900.

30.40 Classical and Biblical Literature 3 Cl.; 3 Cr.
Standard works of antiquity, chiefly those which continue today in popular favor. Works assigned will be examined as to meaning, tone, and historical context.

30.41 European Literature 3 Cl.; 3 Cr.
Five or six European works of lasting importance, affording a variety of literary types, historical periods, and national origins.

30.42 Masterpieces of England and America 6 Cl.; 3 Cr.
Selected works drawn mainly from the 20th century. Authors will include Faulkner, Joyce, Melville, Katherine Anne Porter, Steinbeck, Virginia Woolf, Bergan Evans.

30.43 History of the English Novel, 20th Century 4 Cl.; 4 Cr.
Study of Laurence, Huxley, Woolf, Forster, Joyce, and related novelists.

30.44 The American Novel, 20th Century 4 Cl.; 4 Cr.
Study of Dreiser, Anderson, Lewis, Marquand, Hemingway, Dos Passos, Faulkner, and related novelists.

30.45 History of the English Novel, 18th Century 4 Cl.; 4 Cr.
Background to and early decades of the novel, with reading from such representative novelists as Defoe, Fielding, Smollett, Scott, Jane Austen.

30.46 History of the English Novel, 19th Century 4 Cl.; 4 Cr.
Study of such representative novelists as Emily Brontë, George Eliot, Trollope, Thackeray, Meredith, Hardy.

30.47 The Modern Novel 4 Cl.; 4 Cr.
Outstanding novels of the 20th century, with emphasis on the social outlook they imply.

30.48 The Modern Drama 4 Cl.; 4 Cr.
Native and European drama since 1900, with emphasis on the relationship between drama and history in the 20th century.

30.50 Representative Novels 5 Cl.; 2½ Cr.
Significant novels of the postwar period in America — Salinger, Bellow, Mailer, and others.

30.51 Introduction to Journalism 4 Cl.; 4 Cr.
Functions of the editorial department and general tasks of an "inside" man. Extensive practice in the rewriting of news stories.

30.52 Introduction to Journalism Prep. 30.51; 4 Cl.; 4 Cr.
Problems of reporting and newswriting, with written assignments in all types of spot news reporting.

30.53 Techniques of Journalism Prep. 30.52; 4 Cl.; 4 Cr.
Editing the news. Writing of edtorials, feature articles, and columns.

30.54 Techniques of Journalism Prep. 30.53; 4 Cl.; 4 Cr.
Continued practice in newspaper writing, the covering of special assignments, and editorial problems.

30.55 Vocabulary Building 3 Cl.; 3 Cr.
Greek, Latin, and Germanic elements from which modern English words are evolved. History of the language and types of semantic change.

30.57 Introduction to Semantics 3 Cl.; 3 Cr.
Ways in which language habits affect thinking processes and raise problems in social relationships.

30.58 Introduction to Literary Criticism 5 Cl.; 2½ Cr.
Major schools of criticism through a study of Aristotle, Longinus, Sidney, Johnson and a representative group of moderns.

30.60 Modern British and American Poetry 5 Cl.; 2½ Cr.
A close look at the developments in poetry from Yeats and E. A. Robinson to the present.

30.61 Shakespeare
The Elizabethan period, 16th-century London, the Shakespearean stage and audience, and the actors' companies. Shakespeare's life and his development as a dramatist. Five plays intensively studied.

30.62 Shakespeare Prep. 30.61; 4 Cl.; 4 Cr.
Shakespeare's language, the text of the plays, Shakespearean criticism and editors' problems. Four plays and the sonnets intensively studied.

30.63 Chaucer 4 Cl.; 4 Cr.
The Canterbury Tales, with attention to Middle English vocabulary, historical setting, and the rhythms and devices of Chaucer's poetry.

30.64 Chaucer Prep. 30.63; 4 Cl.; 4 Cr.
"Troilus and Criseyde," "The House of Fame," "The Parliament of Fowls," and certain selected parts of "Boece."

30.66 Eugene O'Neill 5 Cl.; 2½ Cr.
Development of Eugene O'Neill as a playwright and his influence in world drama as a writer of tragedy, as naturalist, and as experimenter.

30.68 Joseph Conrad 5 Cl.; 2½ Cr.
Conrad's art related to his Polish heritage, nautical career, theory of life and composition, and literary legacy.

30.70 Eighteenth-Century English Literature 4 Cl.; 4 Cr.
Writings of Dryden, Pope, Swift, and Addison to develop a perspective on the Augustan world.

30.71 Eighteenth-Century English Literature 4 Cl.; 4 Cr.
Dr. Johnson, Boswell, Sterne, Gray, and Blake are the major figures dealt with.

30.72 Seventeenth-Century English Literature 4 Cl.; 4 Cr.
Major creative writings of the first half of the 17th century, including Bacon, Jonson, and Donne, but excluding the drama.

30.73 Seventeenth-Century English Literature 4 Cl.; 4 Cr.
Writings of Milton, Marvell, Butler, Bunyan and related figures.

30.75 The Bible   5 Cl.; 2½ Cr.
Selected books of the Bible considered in their literary and historical
aspects.

30.78 Literature of the Romantic Period   4 Cl.; 4 Cr.
A survey of major literary trends in the English and European tradition from
1789 to 1860. Readings will include selections from the poetry and criti-
cism of the Romantic period in England, as well as selections reflecting
related developments in France, Germany, and America.

30.79 Literature of the Victorian Period   4 Cl.; 4 Cr.
A survey of major literary trends in the English and European tradition from
1860 to 1910. Readings will include selections from the poetry and criticism
of the Victorian period in England, as well as selections reflecting related
developments in France, Germany, and America.

30.80 Seminar in Journalism   2 Cl.; 2 Cr.
The college newspaper and professional problems of procuring, presenting,
and purveying news. Required of "News" editors.

30.82 Swift and his Circle   4 Cl.; 4 Cr.
Major writings of Jonathan Swift, the themes and techniques of his satire,
his times; related authors.

30.83 Johnson and his Circle   4 Cl.; 4 Cr.
Major writings of Dr. Johnson, with incursions into related writers.

30.95, 30.96, 30.97, 30.98 Honors Program   4 Cr. each course
See page 93.

Modern Languages

French

31.01 Elementary French   3 Cl.; 3 Cr.
Essentials of grammar, practice in pronunciation, and progressive acquisition
of a basic vocabulary and idiomatic expressions.

31.02 Elementary French   Prep. 31.01; 3 Cl.; 3 Cr.
More difficult points of grammar, particularly uses of subjunctive mood.

31.03 Elementary French   Prep. 31.02; 3 Cl.; 3 Cr.
Reading of simple French prose, with written and oral exercises based on the
material read. French conversation is encouraged.

31.04 Elementary French   Prep. 31.03; 3 Cl.; 1½ Cr.
Reading of French prose of moderate difficulty; with practice in conversation.

31.11 Introduction to French Literature   3 Cl.; 3 Cr.
Intermediate course for freshmen who have had two or three years of high
school French. A review of grammar with practice in composition and con-
versation.

31.12 Introduction to French Literature Prep. 31.11; 3 Cl.; 3 Cr.
History of French civilization with discussions and conversation.

31.13 Introduction to French Literature Prep. 31.12; 3 Cl.; 3 Cr.
Intensive reading of modern prose with conversational practice.

31.14 Introduction to French Literature Prep. 31.13; 3 Cl.; 1½ Cr.
Reading and conversation.

31.15 Intermediate French Prep. 31.04; 4 Cl.; 4 Cr.
French civilization through texts of average difficulty; review of grammar;
written and oral exercises.

31.16 Intermediate French Prep. 31.15; 4 Cl.; 4 Cr.
Reading of modern prose with conversational practice.

31.17 French Composition and Conversation Prep. 31.16; 4 Cl.; 4 Cr.
Grammar review, written work and conversation.

31.18 French Composition and Conversation Prep. 31.17; 4 Cl.; 4 Cr.
Free composition, oral reports and class discussion.

31.19 Readings from Contemporary French Prep. 31.16; 5 Cl.; 2½ Cr.
Selected passages from narrative and dramatic prose of the last fifty years.
Among the writers included are Colette, Duhamel, Renard, Rolland, Vildrac,
Anatole France, Gide, Proust, Romains, and Sartre.

31.21 French Literature from 1850 to 1900 Prep. 31.16; 4 Cl.; 4 Cr.
The novel, especially of Flaubert, Zola, Daudet, Loti, and Huysmans. Selec-
tions from Sainte-Beuve, Taine, and Renan.

31.22 French Literature from 1850 to 1900 Prep. 31.16; 4 Cl.; 4 Cr.
Lyric poetry of the Parnassian and Symbolist schools, with selections from
Gautier, Banville, Leconte de Lisle, Hérédia, Sully-Prudhomme, Baudelaire,
Verlaine, Mallarmé, and Rimbeau. Plays of the period are assigned for out-
side reading.

31.23 French Classicism Prep. 31.16; 4 Cl.; 4 Cr.
Background and non-dramatic literature of the 17th century. Selections
from Malherbe, Descartes, Pascal, La Fontaine, Mme. de Sévigné, Mme. de La
Fayette, Bossuet, and Fénelon.

31.24 French Classicism Prep. 31.16; 4 Cl.; 4 Cr.
Dramatic theories especially by Boileau. Plays of Corneille, Molière, and
Racine.

31.25 French Romanticism Prep. 31.16; 4 Cl.; 4 Cr.
Origins and development of the Romantic movement in France. Selected
poems by Lamartine, Hugo, Musset, and Vigny. Characteristic Romantic
prose.

31.26 French Romanticism Prep. 31.16; 4 Cl.; 4 Cr.
Dramatic theories expounded in the "Préface de Cromwell" and Romantic
dramas.

31.27 Survey of French Literature

Prep. 4 yrs. of high school French; 3 Cl.; 3 Cr.

Medieval masterpieces in modern French versions, with emphasis on the Song of Roland, the novels of Chrétien de Troyes, and the poetry of Villon.

31.28 Survey of French Literature
Prep. 31.27; 3 Cl.; 3 Cr.

Introduction to the French Renaissance, with particular attention to Rabelais, Montaigne, and the poets of the Pléiade.

31.29 Survey of French Literature
Prep. 31.28; 3 Cl.; 3 Cr.

After a brief discussion of the 17th century, the course deals with the writings of the "philosophers," particularly Diderot and Voltaire.

31.30 Survey of French Literature
Prep. 31.29; 3 Cl.; 1½ Cr.

A continuation of 31.29 with special attention on Beaumarchais and Chénier.

31.95, 31.96, 31.97, 31.98 Honors Program
4 Cr. each course

See page 93.

German

32.01 Elementary German
3 Cl.; 3 Cr.

Essentials of grammar; practice in pronunciation; acquisition of a basic vocabulary and idiomatic expressions.

32.02 Elementary German
Prep. 32.01; 3 Cl.; 3 Cr.

More difficult points of grammar, particularly uses of subjunctive mood.

32.03 Elementary German
Prep. 32.02; 3 Cl.; 3 Cr.

Reading of simple German prose, with oral and written exercises based on material read. German conversation is encouraged.

32.04 Elementary German
Prep. 32.03; 3 Cl.; 1½ Cr.

Reading of German prose of moderate difficulty; conversation.

32.15 Intermediate German
Prep. 32.04; 4 Cl.; 4 Cr.

German civilization through texts of average difficulty. Review of grammar and written and oral exercises.

32.16 Intermediate German
Prep. 32.15; 4 Cl.; 4 Cr.

Reading of modern prose; conversational practice.

32.17 German Composition and Conversation
Prep. 32.16; 4 Cl.; 4 Cr.

Grammar review; written work; German conversation.

32.18 German Composition and Conversation
Prep. 32.17; 4 Cl.; 4 Cr.

Free composition; oral reports, class discussions.

32.19 Scientific German
Prep. 32.16; 5 Cl.; 2½ Cr.

Reading of scientific German. Articles dealing with chemistry, physics, mathematics, and biology.

32.21 Modern German Literature   Prep. 32.16; 4 Cl.; 4 Cr.
Main currents of German literature since 1880. The novel and short story of
leading authors.

32.22 Modern German Literature   Prep. 32.16; 4 Cl.; 4 Cr.
Drama and poetry. Representative selections from the Naturalistic, Impres-
sionistic, and Expressionistic movements.

32.23 The Classical Period of German Literature   Prep. 32.16; 4 Cl.; 4 Cr.
Development of German literature during the second half of the eighteenth
century, dealing especially with the works of Lessing and Schiller.

32.24 The Classical Period of German Literature   Prep. 32.16; 4 Cl.; 4 Cr.
Life and works of Goethe, with emphasis on his lyric and dramatic poetry.

32.25 German Literature of the Nineteenth Century   Prep. 32.16; 4 Cl.; 4 Cr.
Chief tendencies in German literature from the beginning of Romanticism to
the coming of Naturalism. Representative prose works of principal writers.

32.26 German Literature of the Nineteenth Century   Prep. 32.16; 4 Cl.; 4 Cr.
Drama and poetry. Selections from Kleist, Hölderlin, Eichendorff, Novalis,
Heine, and Hebbel.

32.95, 32.96, 32.97, 32.98 Honors Program   4 Cr. each course
See page 93.

Spanish

33.01 Elementary Spanish   3 Cl.; 3 Cr.
Essentials of grammar; practice in pronunciation; progressive acquisition of
basic vocabulary and idiomatic expressions.

33.02 Elementary Spanish   Prep. 33.01; 3 Cl.; 3 Cr.
More difficult points of grammar, particularly the uses of the subjunctive
mood.

33.03 Elementary Spanish   Prep. 33.02; 3 Cl.; 3 Cr.
Reading of simple Spanish prose, with written and oral exercises based on
the material read. Spanish conversation is encouraged.

33.04 Elementary Spanish   Prep. 33.03; 3 Cl.; 1½ Cr.
Reading of Spanish prose of moderate difficulty; conversation.

33.15 Intermediate Spanish   Prep. 33.04; 4 Cl.; 4 Cr.
Spanish civilization through texts of average difficulty; review of grammar;
written and oral exercises.

33.16 Intermediate Spanish   Prep. 33.15; 4 Cl.; 4 Cr.
Reading of modern prose, with conversational practice.

33.17 Spanish Composition and Conversation   Prep. 33.16; 4 Cl.; 4 Cr.
Grammar review, written work, and conversation.

33.18 Spanish Composition and Conversation   Prep. 33.17; 4 Cl.; 4 Cr.
Free composition, oral reports, and class discussions.

33.19 Readings from Contemporary Spanish   Prep. 33.16; 5 Cl.; 2½ Cr.
Selected passages from narrative and dramatic prose of the last fifty years.
Among writers included are Unamuno, "Azorin," Benavente, Ibáñez, Baroja,
Valle-Inclán, Ayala, and Ortega y Gasset.

33.21 Spanish Literature of the Golden Age   Prep. 33.16; 4 Cl.; 4 Cr.
Works of Cervantes, particularly "Don Quixote."

33.22 Spanish Literature of the Golden Age   Prep. 33.16; 4 Cl.; 4 Cr.
Drama of Lope de Vega, Tirso de Molina, and Calderón.

33.23 Spanish Literature of the Nineteenth Century   Prep. 33.16; 4 Cl.; 4 Cr.
Literature of Spain during first half of nineteenth century, Romantic drama
and poetry.

33.24 Spanish Literature of the Nineteenth Century   Prep. 33.16; 4 Cl.; 4 Cr.
Spanish literature of second half of nineteenth century, particularly the
Realistic novel.

33.25 Spanish American Literature   Prep. 33.16; 4 Cl.; 4 Cr.
General trends of Spanish American literature, including the colonial period,
the period of the struggle for independence, and the 19th-century epic
of the Gaucho and the Indian.

33.26 Spanish American Literature   Prep. 33.16; 4 Cl.; 4 Cr.
Better known as Spanish American writers of the Modernistic, Realistic, and
Contemporary periods, with emphasis on Rubén Darío and Gabriela Mistral.

33.95, 33.96, 33.97, 33.98 Honors Program   4 Cr. each course
See page 93.

Russian

34.01 Elementary Russian   5 Cl.; 5 Cr.
Essentials of grammar; practice in pronunciation; progressive acquisition of
a basic vocabulary and idiomatic expressions.

34.02 Elementary Russian   5 Cl.; 5 Cr.
More difficult points of grammar; additional vocabulary, reading of simple
prose.

34.03 Intermediate Russian   5 Cl.; 5 Cr.
Grammar review; written work; reading of prose of moderate difficulty.

34.04 Intermediate Russian   5 Cl.; 5 Cr.
Reading of scientific prose.

34.19 Scientific Russian   Prep. 34.04; 4 Cl.; 4 Cr.
The objective of this course is to give the student a basic scientific termi-
nology, introduced through selected texts dealing with a variety of subjects.

34.20 Scientific Russian   Prep. 34.19; 4 Cl.; 4 Cr.
A continuation of 34.19 with emphasis on current periodical scientific
literature.

34.21 Russian Literature of the Nineteenth Century   Prep. 34.04; 4 Cl.; 4 Cr.
The life and work of the outstanding authors of this period. Readings in
Russian and in English translation.

34.22 Russian Literature of the Nineteenth Century   Prep. 34.21; 4 Cl.; 4 Cr.
A continuation of 34.21.

Sociology - Anthropology

36.01 Principles of Anthropology   4 Cl.; 4 Cr.
Man's place in nature, his biological development from proto-human forms,
the nature and meaning of racial differences, the emergence and growth of
culture, and the comparison of cultural patterns in contemporary world so-
ciety. Basic concepts of anthropology.

36.02 Principles of Sociology   Prep. 36.01; 4 Cl.; 4 Cr.
The basis of human society, the process of individual adjustment to society
and the matter of numbers, spatial distribution and organization of people.
Social institutions, with emphasis on a structural, functional analysis of in-
stitutional life.

36.03 Comparative Culture I   Prep. 36.02; 4 Cl.; 4 Cr.
The ways people have developed different learned modes of adjustment to
universal human situations. Anthropological material from a wide variety of
cultures showing how economic, political and religious behavior may be
understood only in the context of a people's environment.

36.04 Comparative Culture II   Prep. 36.02; 4 Cl.; 4 Cr.
An intensive analysis of one or two social systems with emphasis upon the
comparative point of view. Materials drawn from non-American cultures are
discussed to give the student a more penetrating view of his own society.

36.05 American Society I   Prep. 36.02; 4 Cl.; 4 Cr.
American society, culture, and major social institutions: economic, religious,
governmental, familial, educational, welfare, and recreational. Social classes
and stratification, mobility, and individualism.

36.06 American Society II   Prep. 36.02; 4 Cl.; 4 Cr.
The function of sub-groups and sub-cultures is examined for American so-
ciety. Deviant behavior and value systems are discussed in relationship to
national norms and value systems.

36.07 Individual and Society I   Prep. 36.02; 4 Cl.; 4 Cr.
Role of culture in determining personality development. Cross-cultural data is used to show variations in the enculturation process. The relationship between culture and mental health.

36.08 Individual and Society II   Prep. 36.02; 4 Cl.; 4 Cr.
Interdependence between the individual and social structure. Relationship of the individual to his group in terms of status, roles, rights, and obligations as these pertain to the critical periods in the life cycle.

36.09 Social Research Methods I   Prep. 20 credits in sociol. and/or anthro.;
                                                              4 Cl.; 4 Cr.

The relationship of social research to method. Research design, concept formation and techniques of data gathering. Contrast among techniques of social anthropologists, survey, sociometry, theoretical and applied social science. Observation and interviewing techniques. Quantitative analysis of qualitative materials. Utilization of basic statistical tools. Social research writing and the problems of research budgeting and communication. Development of student research problems and appreciation.

36.10 Social Research Methods II   Prep. 36.09; 4 Cl.; 4 Cr.
Continues course 36.09 with further emphasis on student research problems, analysis, and report communication.

36.11 Social Theory I   Prep. 20 credits in sociol. and/or anthro.; 4 Cl.; 4 Cr.
A history of social thought from ancient times to the early 19th century. Concepts are studied in relationship to individual thinkers and their sociocultural situations. Contrasts between philosophical and social science points of view.

36.12 Social Theory II   Prep. 36.11; 4 Cl.; 4 Cr.
Sociological theory as it develops from the social thought of Darwin, Marx, and their nineteenth-century contemporaries. Contributions of European and American social scientists to schools of thought that emerged in the periods preceding and following the First World War; special emphasis on contemporary American sociology, its antecedents, and its prospects.

36.20 Social Ecology and Community Analysis I   Prep. 36.02 or 36.40S;
                                                              4 Cl.; 4 Cr.

Relationship of man to his environment. Ecological theories of spatial distribution and mobility. Development of the concept of community in relation to physical environment, member population and social institutions.

36.21 Social Ecology and Community Analysis II   Prep. 36.02 or 36.40S;
                                                              4 Cl.; 4 Cr.

The structure and function of communities and their component parts. Relations between communities and such broader entities as regions, political units, bureaucratic structures. Community action programs.

36.22 Small Group Analysis I   Prep. 36.02; 4 Cl.; 4 Cr.
The small group is examined in terms of its particular role in human society from both a structural and functional point of view.

36.23 Small Group Analysis II Prep. 36.02; 4 Cl.; 4 Cr.
Special attention to discussion of research on small group process. Materials relevant to group dynamics are considered and pertinent training procedures assessed.

36.24 Urban Society I Prep. 36.02 or 36.40S; 4 Cl.; 4 Cr.
The foundations of city life in historical perspective. Relationship of city life to environment, population, social organization, and cultural values. Growth trends in American urban life.

36.25 Urban Society II Prep. 36.02 or 36.40S; 4 Cl.; 4 Cr.
The metropolis and its component parts. Problems and programs associated with the inner city, the suburban fringe and democratic social planning.

36.26 Comparative Social Organization I Prep. 36.02; 4 Cl.; 4 Cr.
Examples of folk and intermediate societies in different culture areas with reference to their special characteristics in contrast to industrial social systems.

36.27 Comparative Social Organization II Prep. 36.02; 4 Cl.; 4 Cr.
A number of industrial societies are examined with a view toward understanding their basic common socio-cultural attributes; implication of mass society, power structure, communication systems.

36.40 Applied Social Relations Prep. 36.02; 2 Cl.; 4 Field Lab.; 4 Cr.
Analysis and evaluation of action programs designed to resolve inter-ethnic and intergroup tensions and social deviancy. Students will be observers in such agencies as social welfare, government, private business, labor groups, and volunteer community or regional civil organizations. Representatives from local groups give occasional lectures. General field trips. A final report in depth. Course aims to sharpen analytical descriptive observation and analysis rather than to stress scientific research methodology.

36.41 Sociology of the Family Prep. 36.02 or 36.40S; 4 Cl.; 4 Cr.
The family as a social institution in several selected cultures. Interrelations of the family and political, economic, and educational institutions. Social nature of personality, role-taking, and the effects of individualism, mobility, and industrialism.

36.42 Physical Anthropology Prep. 36.01; 4 Cl.; 4 Cr.
Examination of the mode of biological evolution together with fossil evidence proving its occurrence. Student becomes acquainted with man's place in nature. A survey of primatology, comparative osteology, heredity, race and the evolution of behavior leading to an understanding of the biological bases of society and culture.

36.43 Criminology Prep. 36.02; 4 Cl.; 4 Cr.
Patterns and evolution of criminal behavior, the social forces involved, and development of the individual criminal. Administration of criminal justice: law, courts, police, prisons.

36.44 Socio-Cultural Change   Prep. 36.02; 4 Cl.; 4 Cr.
Social and cultural dynamics with particular reference to the current contact situation occurring between industrialized and non-industrialized societies.

36.60S Social Problems   8 Cl.; 4 Cr.
A survey for students taking only one course in sociology. Problems considered are delinquency, crime, racial and religious prejudice and discrimination, the handicapped, the family, addictions and related remedial action programs.

36.61S The Family   Prep. 36.40S; 5 Cl.; 2½ Cr.
The role of the family in human society. Interrelationships of family members from the socio-cultural point of view. Relation of the family unit with other institutions, religion, economics, government.

36.63 American Society   4 Cl.; 4 Cr.
A study of modern American culture and its major institutions: economic, religious, governmental, familial, educational, welfare, and recreational. Consideration is given to social classes and other forms of stratification, mobility, and individualism. The parts played by subcultures and cultural integration are also examined. (Not open to Sociology majors.)

36.70, 36.71 Directed Study   4 Cr. each course
Independent work under the direction of members of the department upon a chosen topic. Limited to qualified seniors preparing in sociology and anthropology with approval of department.

36.95, 36.96, 36.97, 36.98 Honors Program   4 Cr. each course
See page 93.

Accounting

41.01 Principles of Accounting   2 Cl.; 2 Lab.; 3 Cr.
Cycle of bookkeeping procedure and analysis of transactions.

41.02 Principles of Accounting   Prep. 41.01; 2 Cl.; 2 Lab.; 3 Cr.
Transaction analysis; special forms of the recording process.

41.03 Principles of Accounting   Prep. 41.02; 2 Cl.; 2 Lab.; 3 Cr.
Accounting features peculiar to the individual proprietorship, the partnership, and the corporation.

41.10 Principles of Accounting   10 Cl.; 10 Cr.
Covers the content of courses 41.01, 41.02, and 41.03. Intended for transfer students.

41.24 Managerial Accounting   3 Cl.; 3 Cr.
Analytical and interpretive aspects of accounting as a managerial tool.

41.27 Accounting Statements   Prep. 41.03; 3 Cl.; 3 Cr.
Preparation and analysis of basic accounting statements.

41.31 Cost Accounting   Prep. 41.24; 3 Cl.; 3 Cr.
Theory and techniques of accounting for the costs of manufactured products.

41.32 Cost Accounting   Prep. 41.31; 3 Cl.; 3 Cr.
Continuation of 41.31.

41.33 Cost Accounting for Management   10 Cl.; 5 Cr.
Basic cost accounting theory and practice. Use of cost data as a management tool. Offered during summer term.

41.34 Industrial Accounting   3 Cl.; 3 Cr.
For industrial engineering students only. Foundation in basic accounting principles and procedures.

41.35 Industrial Accounting   Prep. 41.34; 5 Cl.; 5 Cr.
For industrial engineering students only. Accounting theory and practice. Uses of accounting data as a management tool.

41.37 Intermediate Accounting   Prep. 41.24; 3 Cl.; 3 Cr.
Problems of valuation and presentation of corporate accounts.

41.38 Intermediate Accounting   Prep. 41.37; 3 Cl.; 3 Cr.
A continuation of 41.37.

41.42 Budget Procedure   Prep. 41.33; 5 Cl.; 2½ Cr.
Basic principles and procedures of budget preparation. Offered during summer term.

41.43 Auditing   Prep. 41.38; 3 Cl.; 3 Cr.
Auditing principles and procedures.

41.44 Auditing   Prep. 41.43; 3 Cl.; 3 Cr.
Continues the work of 41.43.

41.45 Advanced Accounting I   Prep. 41.38; 3 Cl.; 3 Cr.
Accounting for partnership operations, special sales procedures, and actuarial science.

41.47 Consolidated Statements   Prep. 41.45; 3 Cl.; 3 Cr.
Accounting and economic problems involved in preparation of consolidated statements.

41.55 Advanced Accounting II   Prep. 41.47; 3 Cl.; 3 Cr.
Branch accounting; fiduciary, municipal, and institutional accounting.

41.56 Role of Accounting in Decision-Making   2 Cl.; 2 Cr.
Accounting as a tool for managerial analysis and control.

41.59 Federal Income Taxes　　　　Prep. 20.17 or 41.03; 5 Cl.; 2½ Cr.
Brief survey of the Federal tax structure. Application of tax principles to specific problems. (Not open to accounting majors.) Offered during summer term.

41.61 Accounting Seminar I　　　　　　　　　　　　2 Cl.; 2 Cr.
Evolution of accounting concepts and principles. General discussion and preparation of outline for paper to be presented in Course 41.62.

41.62 Accounting Seminar II　　　　　　Prep. 41.61; 2 Cl.; 2 Cr.
Discussion and presentation of research papers.

Industrial Relations

42.52 Motion and Time Study　　Prep. 45.35, 45.22; 1 Cl.; 2 Lab.; 2 Cr.
A survey course for students in the industrial relations curriculum. Motion and time study techniques. Work measurement techniques; micromotion. Emphasis on management and labor relations aspects. Laboratory demonstrations and projects.

42.60 Current Issues in Industrial Relations　　　　　8 Cl.; 4 Cr.
Background and structure of management-union relations; problem areas in collective bargaining; industrial disputes and legislation affecting the right to strike; union internal affairs; political activities of labor and industry. Offered during Summer Term.

42.62 Seminar in Collective Bargaining　　　　Prep. 20.26; 4 Cl., 4 Cr.
Discussion of cases or reports on problems faced by industrial relations departments dealing with employees through collective bargaining. Individual research.

Marketing

43.23 Marketing I　　　　　　　　　　　　3 Cl.; 3 Cr.
Basic marketing functions, institutions, and policies. Emphasis on industrial and ultimate consumer analysis, product policy, channels of distribution, and pricing.

43.24 Marketing II　　　　　　　　　　　　3 Cl., 3 Cr.
A continuation of 43.23 with emphasis placed on student recognition and handling of marketing problems. Topics such as: personal selling, advertising, marketing research, and integrated sales programs.

43.35 Marketing Management I　　　　Prep. 43.23; 43.24; 3 Cl.; 3 Cr.
Analysis of marketing problems. Decision-making and managerial aspects of a marketing program. Case studies are utilized.

43.36 Marketing Management II　　　　　　　　　3 Cl.; 3 Cr.
A continuation of 43.35. Particular emphasis on advertising management.

43.37 Sales Management   Prep. 43.23, 43.24; 3 Cl.; 3 Cr.

Organization of sales department, planning sales force activities, operation of sales force, and evaluation of results.

43.40 Advertising Production   Prep. 43.23, 43.24; 3 Cl.; 3 Cr.

Mechanical problems and processes in advertising. Major emphasis is on printed advertising. Includes study of production techniques in television and radio. Individual advertising projects are worked out.

43.42 Marketing Policy   Prep. 43.23, 43.24; 3 Cl.; 3 Cr.

Primarily a case-study course oriented to the analysis of problems in marketing strategy and policy.

43.43 Marketing Research I   Prep. 43.23, 43.24; 3 Cl.; 3 Cr.

The scientific method, research methodology and its validity. Influence of behavioral and social sciences in solution of marketing problems.

43.45 Marketing Research II   Prep. 43.43; 3 Cl.; 3 Cr.

Case studies, several of which require operations research and behavioral science concepts, provide opportunity to apply the methods and techniques studied in Course 43.43.

43.46 International Marketing   3 Cl.; 3 Cr.

Problems, policies, and techniques essential to effective international marketing.

43.50 Industrial Marketing   2 Cl.; 2 Cr.

Selected topics covering a variety of phases of industrial marketing are the bases for individual research, discussion and lecture.

43.52 Retail Merchandising   Prep. 43.23, 43.24; 3 Cl.; 3 Cr.

Analytical study of retailing. Managerial functions stressed. Cases and readings used.

43.60 Marketing Controls   Prep. 43.42; 4 Cl.; 4 Cr.

Emphasizes the analytical selection of advertising media and use of accounting and statistical controls necessary for measurement of advertising and selling efforts.

43.61 Current Issues in Foreign and Domestic Marketing
                    Prep. basic course in Economic Principles. 8 Cl.; 4 Cr.

A program of reading, discussion and analysis of current marketing topics. Offered during Summer Term.

43.62 Seminar in Marketing Theory   Prep. 43.23; 43.24; 4 Cl.; 4 Cr.

Concepts of behavioral and social sciences applied in the synthesis and analysis of marketing theory and practice.

Finance and Insurance

44.20 Introduction to Finance   3 Cl.; 3 Cr.
Role of finance in the economic world. Survey of financial institutions and their functions. Capital formation.

44.22 Principles of Risk and Insurance   3 Cl.; 3 Cr.
Basic principles of insurance and risk. Types of insurance; organizations in field of insurance.

44.31 Business Finance   Prep. 44.20; 4 Cl.; 4 Cr.
Financial organization and management. Financial and legal implications of form of organization.

44.32 Business Finance   Prep. 44.31; 4 Cl.; 4 Cr.
Working capital, administration of income, financial valuation and principles applicable in cases of consolidation, merger, recapitalization, and bankruptcy.

44.33 Life Insurance   Prep. 44.22; 3 Cl.; 3 Cr.
Life insurance and its place in planning an estate; policy provisions; rate determination; net cost of insurance; legal aspects of life insurance.

44.34 Property and Casualty Insurance   Prep. 44.33; 3 Cl.; 3 Cr.
Detailed study of property-casualty insurance contracts, rates, and financial management of insuror.

44.35 Estate Planning and Taxation   Prep. 44.22; 3 Cl.; 3 Cr.
Trust administration, wills, etc., from the viewpoint of estate planner.

44.36 Estate Planning and Taxation   Prep. 44.35; 3 Cl.; 3 Cr.
Emphasis upon tax implications in relation to financial decisions in business, life insurance, and estate planning.

44.41 Investments   Prep. 44.32; 3 Cl.; 3 Cr.
Methods of analyzing an industry, a particular company in the industry, and specific securities of the company. Protective covenants and remedies of security holders.

44.42 Investments   Prep. 44.41; 3 Cl.; 3 Cr.
Management of investment funds of an individual or an institution with consideration of fluctuations in business cycle and money conditions.

44.52 Security Markets   Prep. 44.42; 3 Cl.; 3 Cr.
Operation of security markets. Brokerage houses, commodity exchanges, government regulation, and problems of security-pricing.

44.58 Personal Finance   Prep. 20.12 or 20.13; 5 Cl.; 2½ Cr.
Planning of personal expenditures, borrowing, budgeting, and building an estate. Offered during summer term.

44.61 Seminar in Finance and Insurance   Prep. 44.42; 4 Cl.; 4 Cr.
Case studies in the area of finance and insurance. Oral reports, group discussions.

44.62 Seminar in Finance and Insurance   Prep. 44.61; 4 Cl.; 4 Cr.
Continuation of case studies, reports, and discussions which began in 44.61.

Management

45.21 Business Management   3 Cl.; 3 Cr.
An introduction to the concepts of business management and organization with emphasis on business operations and the business environment.

45.22 Business Management   Prep. 45.21; 3 Cl.; 3 Cr.
A survey of operating techniques and controls used by business management.

45.36 Personnel Management   Prep. 45.22; 3 Cl.; 3 Cr.
Personnel policy and personnel administration as a tool of management. Timely, significant manpower problems in industry; case studies.

45.37 Personnel Management   Prep. 45.36; 3 Cl.; 3 Cr.
A continuation of 45.36.

45.40 Readings in Management   3 or 4 Cr.
Direct study in management at the senior level.

45.41 Management of Production   Prep. 45.22; 3 Cl.; 3 Cr.
Analysis and discussion of production problems. Case studies used.

45.42 Management of Production   Prep. 45.11; 3 Cl.; 3 Cr.
A continuation of 45.41.

45.52 Management of Sales   2 Cl.; 2 Cr.
Organization and operation of the sales department. Case studies.

45.61 Seminar in Management   3 Cl.; 3 Cr.
Analysis and appraisal of business problems. Readings and case studies used.

45.62 Seminar in Management   4 Cl.; 4 Cr.
A continuation of 45.61.

Business Law

46.03 Contracts and Agency   3 Cl.; 3 Cr.
Basic legal principles of contracts and agency applied to engineering
practices.

46.41 Legal Aspects of Business   3 Cl.; 3 Cr.
Law of Contracts and Agency.

46.42 Legal Aspects of Business   3 Cl.; 3 Cr.
Law of negotiable instruments, suretyship and guaranty.

46.53 Basic Federal Taxes   2 Cl.; 2 Lab.; 3 Cr.
Internal Revenue Code and Treasury Regulations. Taxation of individuals.

46.54 Basic Federal Taxes   2 Cl.; 2 Lab.; 3 Cr.
Taxation of partnerships, corporations, and fiduciaries. Policy-planning for
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46.55 Labor Law   3 Cl.; 3 Cr.
Changing judicial principles and statutory standards of employment and
management-union relations since 1800.

46.56 Law of Merchandising   Prep. 46.24; 3 Cl.; 3 Cr.
The law applicable to the sale of goods. Bailments.

46.57 Law of Corporation Finance and Insurance   Prep. 46.24; 4 Cl.; 4 Cr.
Legal aspects of the various forms of business organization. Principles of in-
surance law and examination of typical policy contracts

Co-operative Education

50.01 Professional Development   3 Cl.; 1 Cr.
For engineers. Orientation of student's thinking along individual professional
development lines; intelligent techniques of job-getting.

Lectures by professional engineers covering the activities of ECPD and
EJC, Engineering Licensure, U. S. Patent System, and Ethics in Engineering
Practice. Professional department chairmen discuss the various aspects of
professionalism.

Concurrently, techniques of job-getting, including qualification records or
résumés, letter writing, interviews, and planning and executing of the job-
getting campaign, are discussed.

50.10 Placement Techniques   1 Cl.; 1 Cr.
For business administration students. Job-getting techniques covering such
items as: qualification records or résumés, letter writing, interviews, and plan-
ning and executing of the job-getting campaign.

50.20 Placement Techniques   2 Cl.; 1 Cr.
For liberal arts, and Pharmacy students. Job-getting techniques covering
a survey of the occupational field, a market survey of opportunities, and
accepted techniques related to job-getting efforts such as: qualification re-
cords, prospect files, letter writing, interviews, and planning and execution
of the job-getting campaign.

Pharmacy

71.01 Basic Pharmacy I 4 Cl.; 3 Lab.; 5 Cr.
Physical and chemical principles and their applications in preparing pharmaceuticals.

71.02 Basic Pharmacy II Prep. 71.01; 4 Cl.; 3 Lab.; 5 Cr.
A continuation of 71.01.

71.11 Advanced Pharmacy VI Prep. 71.10; 3 Cl.; 3 Lab.; 4 Cr.
Detailed study of special techniques, principles, and theory involved in preparation of pharmaceuticals, including study of instrumentation and pharmaceutical equipment.

71.12 Dispensing Pharmacy Prep. 71.11; 3 Cl.; 3 Lab.; 4 Cr.
Lecture and laboratory instruction in the compounding and dispensing of liquid dosage forms of medication. The course includes a prescription clinic which correlates the student's knowledge of the allied sciences to prescription compounding. Liquid prescription specialties are discussed.

71.71 Introduction to Pharmacy I 1 Cl.; 0 Cr.
A discussion of the curriculum, the organizations in pharmacy and their objectives, the ethical standards of the profession, the opportunities in its various branches, and the responsibilities of the pharmacist.

71.72 Introduction to Pharmacy II Prep. 71.71; 1 Cl.; 0 Cr.
A continuation of 71.71.

71.73 Introduction to Pharmacy III Prep. 71.72; 1 Cl.; 0 Cr.
A continuation of 71.72.

72.01 Inorganic Medicinals Prep. 11.49; 4 Cl.; 4 Cr.
Source, methods of manufacture, properties, uses, and compounding of inorganic pharmaceuticals. Purity tests and incompatibilities.

72.02 Drug Analysis Prep. 11.18; 3 Cl.; 4 Lab.; 4 Cr.
Principles of quantitative analysis applied to natural or synthetic chemicals and drugs used in pharmacy and medicine. Emphasis is on official methods.

72.05 Organic Medicinals Prep. 72.04; 3 Cl.; 3 Cr.
Study of modern synthetic drugs and natural products of medicinal importance. Uses, syntheses, incompatibilities, correlation of physical properties, structures, and biological activity.

72.06 Organic Medicinals Prep. 72.05; 3 Cl.; 3 Cr.
A continuation of 72.05.

73.05 Biochemistry Prep. 11.28; 3 Cl.; 3 Lab.; 4 Cr.
The functions that occur in living matter are studied with discussions on physiological significance of metabolic products. The role of vitamins and hormones, characteristics and types of enzyme functions and metabolism of substances essential to health are considered.

73.06 Biochemistry   Prep. 73.05; 3 Cl.; 3 Lab.; 4 Cr.
A continuation of 73.05,

73.07 Pharmacology   Prep. 73.06, 74.04, 73.04, 74.02; 2 Cl.; 2 Cr.
History, basic principles of pharmacology, and general introduction to the
nature of medicinal agents. General principles of toxicology including de-
scriptive terminologies. Classification of poisons and essential emergency
procedures. Pesticides.

73.07T Pharmacology   Prep. 73.07; 3 Cl.; 3 Lab.; 4 Cr.
Agents affecting the skin and the mucous membranes. Dermatological
agents, local anti-infectives, local anesthetics, antitussives, and drugs acting
on the gastrointestinal tract. Dietary adjuvants, agents for obesity, general
therapeutic aids, diagnostics and systemic anti-infective agents.

75.01 Drug Marketing   3 Cl.; 3 Cr.
Marketing institutions and their functions under the existing economic sys-
tem. A survey of many pharmaceutical periodicals is also included.

Nursing

80.01 Fundamentals of Nursing   4 Cl.; 6 Lab.; 6 Cr.
Broad concepts of nursing with introduction to basic principles and skills
essential to patient-centered care.

80.10 Medical-Surgical Nursing   2 Cl.; 6 Lab.; 4 Cr.
Basic principles and concepts related to comprehensive care of medical-
surgical patient.

80.11 Medical-Surgical Nursing   4 Cl.; 9 Lab.; 7 Cr.
A continuation of 80.10.

80.12 Medical-Surgical Nursing   4 Cl.; 12 Lab.; 8 Cr.
A continuation of 80.11.

80.13 Medical-Surgical Nursing   3 Cl.; 9 Lab.; 6 Cr.
A continuation of 80.12.

80.14 Medical-Surgical Nursing   3 Cl.; 9 Lab.; 6 Cr.
A continuation of 80.13.

80.20 Maternity Nursing   4 Cl.; 12 Lab.; 8 Cr.
Care of mothers during entire maternity cycle including care of the new-
born infant.

80.30 Nursing of Children   4 Cl.; 12 Lab.; 8 Cr.
Growth and development of children and care of child during health and
illness.

80.40 Psychiatric Nursing   4 Cl.; 12 Lab.; 8 Cr.
Care of mentally ill to increase understanding of human behaviour in health
and illness.

80.50 Trends in Nursing   3 Cl.; 3 Cr.
Historical development and changes in nursing profession.

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ACADEMIC CALENDAR

September 1964 to June 1965

SEPTEMBER 9 (Wed.): REGISTRA-TION for freshmen. Students must register by 11 a.m. on this date if they wish places reserved for them in the entering class.

SEPTEMBER 9-11 (Wed.-Fri.): ORI-ENTATION WEEK EXERCISES. Attendance of all freshmen is required.

SEPTEMBER 14 (Mon.): REGISTRA-TION (9-11 a.m.) for Div. A upperclassmen. Classes for ALL students begin at 1. p.m. on special schedule.

OCTOBER 12 (Mon.): Columbus Day recess. No classes. University closed.

NOVEMBER 11 (Wed.): Veterans' Day. No classes. University closed.

NOVEMBER 16-20 (Mon.-Fri.): Final examination period for upperclassmen and for Term 1 for freshmen.

NOVEMBER 23 (Mon.): REGISTRA-TION (9-11 a.m.) for Div. B upperclassmen. Classes for ALL students begin at 1 p.m. on special schedule.

NOVEMBER 26-27 (Thurs.-Fri.): Thanksgiving Day recess. No classes in Basic Colleges.

DECEMBER 22 (Tues.): Classes end at 5 p.m. for Christmas recess and reconvene December 28 at 9 a.m.

JANUARY 1 (Fri.): New Year's Day. No classes. University closed. (1965).

JANUARY 25-29 (Mon.-Fri.): Final examination period for upperclassmen, for Term 2 for freshmen.

FEBRUARY 1 (Mon.): REGISTRATION (9-11 a.m.) for Div. A upperclassmen. Classes for ALL students begin at 1 p.m. on special schedule.

FEBRUARY 19 (Fri.): Classes end at 5 p.m. and reconvene February 25 at 9 a.m.

APRIL 5-9 (Mon.-Fri.): Final examination period for upperclassmen, for Term 3 for freshmen.

APRIL 12 (Mon.): REGISTRATION (9-11 a.m.) for Div. B upperclassmen and for those freshmen taking Term 4 in April. Classes for ALL students begin at 1 p.m. on special schedule.

APRIL 19 (Mon.): Patriots' Day Holiday. No classes. University closed.

MAY 14 (Fri.): End of five-week term for those freshmen taking Term 4 in April.

MAY 31 (Mon.): Memorial Day Holiday. University closed.

JUNE 14-18 (Mon.-Fri.): Final examination period for upperclassmen.

JUNE 20 (Sun.): Commencement.

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Northeastern University will welcome gifts and bequests for the following purposes:

(a) For its building program.

(b) For general endowment.

(c) For specific purposes which may especially appeal to the donor.

It is suggested that, when possible, those contemplating gifts or bequests confer with the President of the University regarding the University's needs before legal papers are drawn.

The legal name of the University is "Northeastern University." However, in the making of gifts and bequests to Northeastern the following wording is suggested: "Northeastern University, an educational institution incorporated under the laws of Massachusetts and located in Boston, Massachusetts."

INDEX

Northeastern University

Graduate Division

Actuarial Science — Offers a program leading to the degree of Master of Science in Actuarial Science.

Arts and Sciences — Offers programs leading to the degrees of Master of Arts and Master of Science, and to Ph.D. degrees in Physics and Chemistry.

Business — Offers evening programs leading to the degree of Master of Business Administration.

Education — Offers late afternoon, evening, and Saturday morning programs leading to the degree of Master of Education.

Engineering — Offers programs leading to the degree of Master of Science with course specification and to the Ph.D. degree in the fields of Electrical and Chemical Engineering.

Pharmaceutical Sciences — Offers programs leading to the Master of Science degree with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

University College

Offers part-time evening programs in various fields of business and the liberal arts designed especially to meet the needs of employed personnel and leading to the Bachelor of Science degree or to appropriate associate degrees.

Department of Law Enforcement and Security — Offers part-time evening programs leading to the degree of Bachelor of Science in the field of Law Enforcement and Security.

The New England Police Institute, in co-operation with the New England Association of Chiefs of Police and the Massachusetts Chiefs of Police Association, conducts special short-term, non-degree programs and seminars.

Lincoln College

Offers part-time evening curricula in science and in engineering technology leading to the degrees of Associate in Science and Associate in Engineering.

Center for Continuing Education

Provides special programs and services for the business and industrial community through seminars, conferences, institutes, and forums, and a wide variety of special courses. These programs are conducted either on the Huntington Avenue campus or at Henderson House, the University's suburban conference center.

Bureau of Business and Industrial Training — Offers both on-campus and off-campus, short-term, non-credit courses to meet the specific training needs of industrial organizations in New England.

Suburban Campus

Offers courses in both the graduate and undergraduate programs of the University at Burlington, Massachusetts.

For further information
regarding any of the above schools, colleges or departments, address
the respective deans or directors.

NORTHEASTERN UNIVERSITY
360 Huntington Avenue, Boston, Massachusetts 02115
262-1100

Northeastern University
COLLEGES OPERATING ON THE CO-OPERATIVE PLAN

College of Liberal Arts

Offers full-time day curricula in science and non-science fields leading to the degree of Bachelor of Arts.

Affiliated Programs:

For medical technologists — Offers full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Arts, in co-operation with the New England Baptist and the New England Deaconess Hospitals.

For dental hygienists — Offers curricula, in affiliation with the Forsyth School for Dental Hygienists, leading to the degree of Associate in Science.

For nurses — Offers instruction in the sciences, humanities, and social studies for student nurses from the Peter Bent Brigham, New England Deaconess, and Children's Hospital Medical Center Schools of Nursing.

College of Education

Offers full-time day curricula leading to the degree of Bachelor of Science in Education in preparation for teaching or administrative positions in elementary and secondary schools.

College of Business Administration

Offers full-time day curricula leading to the degree of Bachelor of Science in Business Administration.

Center for Management Development — Offers executive-development programs based on the principles of Co-operative Education designed to help men in middle-management positions to grow professionally. Courses are conducted at Phillips Academy, Andover, Massachusetts.

Bureau of Business and Economic Research — Conducts basic research in areas of business and industry, particularly with reference to the New England economy.

College of Engineering

Offers full-time day curricula in civil, mechanical, electrical, chemical, and industrial engineering and a part-time evening program, both leading to the degree of Bachelor of Science in Engineering.

College of Pharmacy

Offers full-time day curricula leading to the degree of Bachelor of Science in Pharmacy.

College of Nursing

Offers full-time, three-year curricula leading to the Associate Degree, and prepares candidates for the R.N. Examinations.

Boston-Bouvé College of Physical Education and Physical Therapy

Offers full-time day curricula leading to the degrees of Bachelor of Science in Physical Education and Bachelor of Science in Physical Therapy.

For further information
regarding any of the above colleges, address

Dr. Gilbert C. Garland, Dean and Director of Admissions
NORTHEASTERN UNIVERSITY

360 Huntington Avenue, Boston, Massachusetts 02115

Tel. 262-1100

NORTHEASTERN UNIVERSITY
360 HUNTINGTON AVE BOSTON, MASSACHUSETTS

Tel. 262 1100

NORTHEASTERN UNIVERSITY
University College

PROGRAMS FOR ADULTS

Business
Liberal Arts
Law Enforcement

1964-1965 BULLETIN

TABLE OF CONTENTS

NORTHEASTERN UNIVERSITY

University College

COEDUCATIONAL

**Programs designed especially
to serve the needs of mature adults**

Counseling

Prospective students are encouraged to arrange for personal interviews with the Counseling Staff. Career planning through competent guidance provides an understanding of professional requirements and assists students in planning programs appropriate to their objectives.

Summer Office Hours

Monday-Thursday .... 8:30 A.M. - 8:30 P.M.
(closed 4:30 - 5:30)
Friday .... 8:30 A.M. - 4:30 P.M.

Regular Office Hours

Monday-Friday .... 8:30 A.M. - 8:30 P.M.
(closed 4:30 - 5:30)
Saturday .... 8:15 A.M. - 12:00 NOON

Calendar

1964
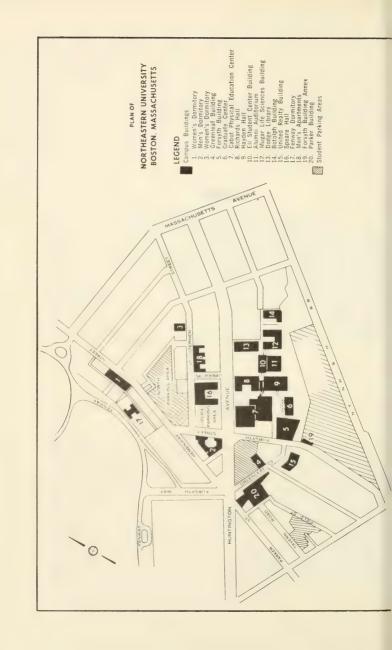
First Summer Session classes begin .... June 1
Class Day .... June 5
Commencement .... June 14
First Summer Session classes end .... July 9
Second Summer Session classes begin .... July 13
Second Summer Session classes end .... August 20
Fall Semester classes begin .... September 14
Legal Holiday — No class sessions .... October 12
Legal Holiday — No class sessions .... November 11
Thanksgiving Holiday — No class sessions .... November 26-28
Final Class session before Christmas recess .... December 19 (Saturday)

1965

First class session after Christmas recess .... January 4 (Monday)
Final Examinations, Fall Semester .... { January 12
                                                                                       { January 18-30
Spring Semester classes begin .... February 1 (Monday)
Legal Holiday — No class sessions .... February 22
Legal Holiday — No class sessions .... April 19
Final Examinations — Spring Semester .... May 17-29
First Summer Session classes begin .... June 7
Class Day .... June 3
Commencement .... June 20
Legal Holiday — No class sessions .... July 5
First Summer Session classes end .... July 15
Second Summer Session classes begin .... July 19
Second Summer Session classes end .... August 26

PLAN OF
NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS

LEGEND

Campus Buildings

1. Women's Dormitory
2. Men's Dormitory
3. Women's Dormitory
4. Greenleaf Building
5. Forsyth Building
6. Graduate Center
7. Cabot Physical Education Center
8. Richards Hall
9. Hayden Hall
10. Ell Student Center Building
11. Alumni Auditorium
12. Mugar Life Sciences Building
13. Dodge Library
14. Botolph Building
15. United Realty Building
16. Speare Hall
17. Fenway Dormitory
18. Men's Apartments
19. Forsyth Building Annex
20. Parker Building

Student Parking Areas

The Governing Boards and Officers of the University

- **The Corporation**
- **The Board of Trustees**
- **General University Committees**
- **Officers of Administration**

6

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Albert Pratt

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*Dwight P. Robinson, Jr.

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Donald B. Sinclair
Philip A. Singleton
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Farnham W. Smith

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. Robert C. Sprague
*Russell B. Stearns
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David B. Stone
*Robert G. Stone

Charles H. Tenney II
*Earl H. Thomson
Chaplin Tyler

Samuel Wakeman
Eustis Walcott
Edward A. Weeks
Sinclair Weeks
William C. White
Raymond S. Wilkins
Roy F. Williams

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CLASS OF 1964

Julius Abrams
S. Whitney Bradley

Fenton G. Keyes
Eugene J. Vogel

CLASS OF 1965

Henry F. Callahan
Alfred E. Lonnberg

Robert H. Willis
Alfred K. Wright

CLASS OF 1966

Carl W. Christiansen
Charles E. Dockser

Donald B. Guy
Stephen D. Lavoie

CLASS OF 1967

Robert D. Black
Alfred di Scipio

James J. Houlahan
S. Peter Shumavon

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Peter W. Princi

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9

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Asa S. Knowles, ex officio

10

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            Dean and Director of the Graduate School of Actuarial Science
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            Dean of Administration of Day Undergraduate Programs
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Virginia Bullard, B.S.   Administrative Assistant, Adult Programs
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                          Assistant to the Dean of the Graduate Division
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                 Chairman, Dept. of Law Enforcement and Security
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                 Assistant, Dept. of Law Enforcement and Security
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Howard F. Greene	Howard A. Myers	Stanley O. Robinson
Paul K. Lambert	Franklin M. Norvish	Leonard A. Seder
	Edward R. Willett	Earl B. Sukeforth

Aims and Scope of the University

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of more than one hundred and twenty-five distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Co-operative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), and Nursing (1964). This time-tested educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, actuarial science, and the pharmaceutical sciences.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. These programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day but who are desirous of broadening their educational background by part-time study. All formal courses of study leading to degrees through evening programs are approved by the appropriate Basic College faculties and are subject to the same quantitative and qualitative standards as the regular day curricula.

The following is a brief outline of the aims and scope of the University's programs.

I. THE EIGHT COLLEGES

1. THE COLLEGE OF LIBERAL ARTS

The College of Liberal Arts offers majors in the usual fields of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Co-operative Plan.

2. THE COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Co-operative Plan, which provides for employment in libraries, social service agencies, and school systems.

3. THE COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development which annually conducts an intensive program designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Co-operative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Phillips Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate co-operative students as research assistants.

4. THE COLLEGE OF ENGINEERING

The College of Engineering offers five-year co-operative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses gven in the day co-operative curriculum, and meets the same qualitative and quantitative standards of scholarship.

5. THE COLLEGE OF PHARMACY

The College of Pharmacy offers five-year co-operative curricula leading to the degree of Bachelor of Science in Pharmacy. Co-operative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

6. THE COLLEGE OF NURSING

The College of Nursing offers a three-year program on the Co-operative Plan which qualifies students for the associate degree and prepares them for the R.N. Examinations. Three of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, and the Massachusetts General Hospital — collaborate with Northeastern University by providing suitable co-operative work opportunities during the second and third years of the program. Graduates of the three-year program may continue toward the Bachelor of Science degree if they so desire.

7. UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other Colleges of the University, offers courses of study leading to certificates, associate degrees, or to the Bachelor of Science degree. University College offers both day and evening programs; the latter are designed specifically to meet the needs of older, more mature students who wish to undertake part-time curricula during late afternoon or evening hours and on Saturday mornings. In co-operation with the Forsyth School for Dental Hygienists, University College also offers a two-year day curriculum leading to the Associate in Science degree.

Quality standards of instruction and requirements for the degrees offered by University College are wholly consistent with those of the other Colleges of the University. University College does not duplicate the offerings of the Colleges of Liberal Arts, Business Administration, Pharmacy, Education, Engineering, and Nursing, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adults desiring formal programs of professional development on a part-time basis, or of young people enrolled in professional schools affiliated with Northeastern University.

8. LINCOLN COLLEGE

Lincoln College offers four-year evening programs of study in several fields of science and engineering technology leading to the degree of Associate in Science or Associate in Engineering. The courses of study are of college grade and cover much of the technological subject matter customarily included in schools of engineering, but the curricula are less extensive in scope than those required for the baccalaureate degree in engineering. They prepare students to work with professional engineers in various technical capacities.

II. THE GRADUATE DIVISION

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

ARTS AND SCIENCES

Master of Arts, Master of Science, Ph.D. in Physics and in Chemistry

BUSINESS

Master of Business Administration

EDUCATION

Master of Education

ENGINEERING

Master of Science with course specification, Ph.D. in the fields of Electrical and Chemical Engineering

ACTUARIAL SCIENCE

Master of Science in Actuarial Science

PHARMACEUTICAL SCIENCES

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology

Some of these programs are offered on the Co-operative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in the Graduate Center Building.

III. CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. Through the Bureau of Business and Industrial Training, the Center provides in-service programs, custom-built to meet specific needs of business and industrial enterprises, while the Division of Special Programs, working co-operatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

IV. AFFILIATED PROGRAMS

1. FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in co-operation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

2. FOR MEDICAL TECHNOLOGISTS

In co-operation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Co-operative Plan leading to the degree of Bachelor of Arts.

3. FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the Peter Bent Brigham, New England Deaconess, and Children's Hospital Medical Center Schools of Nursing.

V. RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are co-ordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction in the areas of art and sciences, business, engineering, pharmacy, nursing, and teacher education, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

Buildings
and
Facilities

Northeastern University is located on Huntington Avenue in the Back Bay section of Boston. The main administrative offices of the University are located in Richards Hall.

The chief railroad centers of Boston are the North and South stations. To reach the University from the North Station, board an MTA subway car going to Park Street and transfer there to any Huntington Avenue car. To reach the University from South Station, board a Cambridge-bound subway train and transfer at Park Street to a Huntington Avenue car. The "Northeastern" station is the first stop outside the subway.

HUNTINGTON AVENUE CAMPUS

The principal educational buildings of Northeastern University are located on sixteen acres of a 42-acre site in the Back Bay section of Boston. Only one block to the west of the University lie the famous Boston Museum of Fine Arts and the beautiful public gardens-park reservation known as "The Fenway." A map of the Huntington Avenue Campus appears on page 2.

Following a long-range development plan, University facilities have expanded substantially in recent years. In addition to seven new buildings, all constructed within the past 25 years, several modernized older buildings are available for specialized uses. The newer buildings are inter-connected by means of tunnels.

18

In addition to classrooms and instructional offices, the principal buildings include the following:

BOTOLPH BUILDING — Department of Civil Engineering

CABOT PHYSICAL EDUCATION CENTER — Gymnasium, Cage, Rifle Range

DODGE LIBRARY — Library, Engineering Drawing Rooms

ELL STUDENT CENTER — Student Activities, Chapel, Auditorium, University Commons

FORSYTH BUILDING — Department of Industrial Engineering, Mechanical Engineering Laboratories, Health Service

GRADUATE CENTER — Administrative Offices of the Graduate Division, Department of Natural Sciences, Physics Laboratories, Cafeteria

GREENLEAF BUILDING — ROTC Headquarters, Research Facilities

HAYDEN HALL — Offices of University College, Center for Continuing Education, Lincoln College, College of Business Administration, College of Education; Department of Electrical Engineering; Department of Art

MUGAR LIFE SCIENCES BUILDING — College of Pharmacy and College of Nursing; Departments of Psychology, Biology, and Chemical Engineering

RICHARDS HALL — Administrative Offices, Chemistry and Mechanical Engineering Laboratories, Bookstore

SUBURBAN CAMPUS AT BURLINGTON — In order to meet the needs of individuals and of industry in the area, Northeastern University has established a Suburban Campus near the junction of Routes 128 and 3 in Burlington, Massachusetts.

In addition to graduate courses in engineering, physics, mathematics, business, science, education, and the arts, portions of undergraduate programs leading to the Associate and Bachelor of Science degrees, special programs for women and non-credit state-of-the-arts programs in the form of seminars, conferences, institutes, forums, and "released-time" programs are offered.

University College

PURPOSE

University College offers evening programs which satisfy both the professional and cultural needs of mature adults who wish to live effectively in a complex society. By utilizing the facilities of the entire university, functional curricula provide for the varied needs and interests of the adult student. Having experienced more life problems, the adult student demands an educational pattern closely related to his professional advancement and social adjustment.

STAFF OF INSTRUCTION

The teaching staff of University College is representative of the Basic Colleges of Northeastern University and includes New England business and professional leaders with backgrounds of training and experience in specialized fields. The faculty are selected because of ability to teach adults in an interesting, inspiring and effective manner.

THE STUDENT BODY

The student body of University College represents diversified interests which properly recognized and utilized become one of the basic strengths in adult education. The needs of individual students vary from a specific course to a full degree curriculum. Committed specifically to education for mature students, University College assumes that recent high school graduates will pursue traditional programs in other colleges. Thus is made possible a greater degree of homogeneity which results in concentration on the needs of adults.

ADMINISTRATIVE POLICIES

Requirements for Admission

All applicants whose credentials are approved by the Committee on Education are admitted as regular or special students.

Regular Students

Applicants for admission as regular students must present evidence of the completion of an approved secondary school course, or the equivalent 15 units.*

Matriculation as a Degree Candidate

The procedure of formal matriculation as a degree candidate may be deferred to provide the student an opportunity to:

(1) Become adjusted to the conditions of evening study.

(2) Acquire the self-discipline necessary for successful scholastic achievement.

(3) Demonstrate to the satisfaction of the Committee on Education his ability to meet the standards established for all degree recipients.

The procedure for admission to degree candidacy is as follows:

(1) The student will officially petition the faculty for admission to the status of a degree candidate.

(2) The student may not register for courses beyond 30 semester hours of credit in University College unless he has matriculated as a degree candidate.

(3) The student must achieve a cumulative quality point average of 2.00 for all courses completed prior to filing his petition.

(4) The Committee on Education may require a student to take one or more aptitude or interest tests if his credentials or academic record fail to give evidence of probable academic success. In this case the student will be notified in writing that arrangements for testing will be made by the student with the University Testing and Counseling Center. A fee is charged for administering these tests.

Special Students

Applicants whose needs and interests can be best served through enrollment in one or more courses or in a certificate program may be admitted as special students. They must satisfy the admission requirements for regular students or the equivalent in training and experience as evidence of their probable success and their ability to profit by the courses.

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*A unit represents a year's work in any subject in any approved secondary school constituting approximately a quarter of a full year's work, or the equivalent. A four-year day high school course is regarded as representing at least 15 units of work, or 3 units in junior high school and 12 units in a three-year high school.

Registration

Before attending classes, students must report to University College Office for registration. No student will be allowed to register for any course after the first week without special permission from the Dean.

A schedule of classes may be obtained by applying at the University College Office.

Transfer Students and Advanced Standing Credit

Advanced standing credit in the College may be obtained in one of two ways as follows:

By Transfer of Credit. Subject to the approval of the Committee on Education, credit may be given for work completed in other approved schools, colleges, and universities. An applicant desiring credit by transfer should indicate his desire at the time of filing his application for admission. The applicant should instruct the Registrar of the institution of previous attendance to mail an official transcript to University College indicating honorable dismissal, courses completed, credits, and grades.

By Examination. 1. For credit: No advanced standing credit is awarded except for work previously completed in courses comparable to those offered in University College or compatible with the objective of the student's curriculum. Credit may be disallowed for work previously completed due to the remoteness of the time of study. These applicants, however, will be granted the privilege of taking an examination for credit.

2. For placement: Applicants who, as a result of previous training and experience, may be considered to possess sufficient knowledge of a subject will be allowed the privilege of taking a special examination in particular courses.

The grade of B or better must be obtained in any examination taken for placement or advanced standing credit. Students who have been dismissed from another institution for academic reasons must accompany their application with a statement from the Dean or other appropriate official of their previous institution setting forth the reasons for dismissal or probationary status with recommendation for continued study. All applicants will be considered on their own merits.

In all cases students admitted by transfer or advanced standing credit from any other institution must meet the requirements for matriculated status as set forth under the regulations applicable to regular students.

Residence Requirement

Every candidate for the B.S. or Associate Degree must fulfill the residence requirement. The residence requirement is defined as the satisfactory completion in University College immediately preceding graduation of 30 consecutive semester hours of work in course; with the further provision that at least 10 of the 30 semester hours must be in the candidate's major field. All programs to meet the residency requirement must have the approval of the Dean. Students whose attendance in degree programs is interrupted for a period of one year or more will be reinstated into the program in effect at the time of their re-entry into University College.

In the case of students who for causes beyond their control move outside of the reasonable commuting area of the College, and who have completed 100 or more semester hours of credit in course, the Committee on Education will entertain a petition to allow them the privilege of completing their degree requirements at some other approved college. Under no circumstances will a degree be awarded to any student who has completed less than 30 semester hours of credit in courses in University College.

Students attending certificate programs must complete in residence the full semester hour requirements of the programs in required courses or substitutions approved by the Dean.

Quality Requirement

A cumulative quality point average of 2.00 is required for graduation.

Graduation with Honor

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. To be considered for graduation with honor a student must have completed a minimum of sixty semester hours of work at Northeastern University. Courses credited by advanced standing will be eliminated in determining honor graduates.

Attendance at Commencement

All candidates for University College degrees are required to attend Commencement in the year of qualification. Degrees in absentia are awarded only to candidates excused for personal or immediate-family illness, military service, or employment obligations beyond the control of the candidate.

A petition to receive a degree in absentia must be presented to the Dean. Each petition will be acted upon by the Dean. The candidate has the privilege of appeal to the Provost.

General Information

Class Attendance and Preparation

Classes are held each evening, Monday through Friday, and on Saturday morning. Students must attend 70% of the class sessions to be eligible to take the final examination. Attendance credit is granted only when the student is in attendance at least three-quarters of the class period. Three separate absences of less than 30 minutes each constitutes one complete absence.

Students should average two hours of preparation for each hour spent in the classroom.

Program Changes

Students withdrawing from classes must report in person to the office.

No change of program other than a withdrawal from a course will be approved after the second class meeting. After initial registration, changes of program to include changing of nights or sections will be permitted only for exceptional reasons.

Change of Address

Notify the University College Office immediately of any change of address.

Examinations

Term tests are scheduled in each semester, at the option of the instructor and are regarded as part of the terms of course work. A final examination will be held at the end of each semester in each course unless an announcement to the contrary is made. The minimum passing grade in a final examination is D. Make up examinations will be allowed only for final examinations. There will be no make up privilege for the term tests or hour examinations. A fee of $5.00 is charged for a final exam make-up.

Grades and Credits

The following system of grading is in use:

Superior Work, A; Above Average Work, B; Average Work, C; Lowest Passing Grade, D; Failure, F; Incomplete, I.

Quality Points

The requirement for graduation from University College is 130 semester hours with attainment of a quality point average of 2.00. Although the credits allowed for acceptable work completed elsewhere by transfer students count towards fulfillment of quantitative graduation requirements, neither the credits nor the grades earned in such courses are included in quality point computations for graduation.

The method of figuring quality points is as follows: Each semester course of A grade is multiplied by 4, B grade by 3, C grade by 2, D grade by 1, and F grade or Incomplete by 0. The total number of quality points, divided by the Total number of semester courses completed, shall be the quality point average.

Students receiving an F grade in a required course must repeat the course in its entirety including term work, examinations and attendance.

The policy is followed of mailing all grade and status reports to students instead of issuing these reports at University College Office or over the telephone.

Academic Probation

Students whose scholarship in any given period is unsatisfactory may be dropped from the College or may be placed on probation.

Disciplinary Probation

The Committee on Education has the authority to dismiss from the College or place on probation at any time or to strike from the list of candidates for the degree any student whom it may deem unworthy because of conduct or character. The Committee may ask any student to withdraw from the College who is obviously out of sympathy with the aims and ideals of the College.

The University Library

The Dodge Library houses the research collections for all University programs. Library collections are located in six main areas — **one,** the General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card; **two,** the Reference Collection in the Cabot Reading Room to the left of the Circulation Desk, which includes bibliographies, government documents, maps, company publications, the information file, association publications, and theses; **three,** the Periodical Collection on the basement level occupying the Lower Reading Room and the first two back stack levels; **four,** the Reverse Book Collection is adjacent to the periodical room on the basement level; **five,** the American and English Literature Collections in the Webster Reading Room to the right of the Circulation Desk; **six,** the Audio-Facility consisting of sound recordings and magnetic tapes for instructional and individual use in the Richardson Room on the second floor.

The Card Catalog is a union list of materials in the University Library and is located to the left and right of the Circulation Desk.

The Circulation Department has an IBM card file of all students attending the University. To borrow materials students should present university identification at the Circulation Desk. For extensive research, where it is not possible for the University Library to acquire materials, the inter-library loan system allows the acquisition of items from other collections throughout the country.

The Dodge Library is open Monday through Thursday 8:30 a.m. to 10:00 p.m. and Friday 8:30 a.m. to 7:30 p.m.; Saturdays 8:30 a.m. to 4:30 p.m. The reading rooms are open from 8:00 a.m. to 10:00 p.m. Monday through Thursday, from 8:00 a.m. to 7:30 p.m. on Friday, and from 8:30 a.m. to 4 p.m. on Saturday. In addition, the Richardson Room is open until 11:00 p.m. Monday through Thursday and until 10:00 p.m. on Friday. This room is also open on Sunday from 1 p.m. to 5 p.m. The privilege of obtaining books from the Boston Public Library is extended to students of University College. Application for this privilege, which involves a fee, should be made directly to the Boston Public Library.

Counseling

Prospective students, or those desiring advice or guidance regarding any part of the college work or curricula, are encouraged to arrange for personal interviews with the Counseling Staff. Such counseling is extremely important for the proper planning of an educational program.

PLACEMENT SERVICE

For Students

Many requests from employers are received by the College, for young men and women of potential ability to fill important positions of responsibility. It is the policy of the College to serve the students whenever possible by placing them in those positions which promise attractive opportunities for development and advancement. The College, however, cannot guarantee to place its students, but it does endeavor to keep in close touch with those who desire placement service and to assist them in obtaining satisfactory advancements in positions and income. No charge is made for placement service. Those needing this assistance should arrange an appointment with the Director of Placement.

For Graduates

While the College cannot guarantee positions to its graduates, the number of requests for men usually exceeds the number available in the graduating class of any given year. The policy of the College is to find the best equipped and qualified men and women among its graduates for the positions which the College is called upon to fill.

The College, in recommending a graduate for a position, furnishes the prospective employer with the facts as to the graduate's ability, character, attitudes, habits, and other qualifications for the position as revealed by the College records. In the last analysis, however, placement in a position depends quite largely upon the graduate's ability to sell his services to the prospective employer. Most employers prefer to consider two or more candidates for a position and generally request the College to suggest more than one person. Many manufacturing and commercial firms throughout New England call upon the College to assist them in filling important executive and managerial positions.

No charge is made for placement service.

STUDENT ACTIVITIES

Student activities at University College are planned, organized and operated by the student body to keep pace with changing student needs as well as to provide maximum opportunity for student participation. The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The program is dedicated to assisting the adult student in the development of his fullest potential.

Evening Student Activities

The Purposes of Evening Student Activities are:

(1) To encourage and reward scholarship.

(2) To provide opportunities for the development and pursuit of cultural interests and professional objectives.

(3) To encourage the development of leadership activities and skills.

(4) To enable the student to identify more closely with the University.

(5) To include the family, as an important and vital motivating force in the evening student's educational career.

Student Activities Council

The STUDENT ACTIVITIES COUNCIL is in charge of the social and extracurricular life of the College. The Council, consisting of representatives from the various classes, sponsors social coffee hours, student dances, and an annual Christmas Party for the children of University College students, and assists in Class Day exercises, student orientation, and other projects.

The Council represents the interests of the student body and acts as an advisory group in student affairs. The faculty and administration consult with the Council in regard to University policies.

The Student Orientation Committee publishes a Student Handbook which is distributed to all University College students and sponsors an orientation program each fall for new students.

THE UNICORN

THE UNICORN is the student newspaper for University College. The Unicorn serves as the main line of communication between the students, faculty, and administration. Students wishing to join the editorial staff or submit articles for publication should contact the Director of Student Activities of University College.

THE NORTHEASTER

THE NORTHEASTER is the yearbook published by the Senior Committee. Seniors are requested to help with the organization and development of the yearbook by becoming members of the Senior Committee. In addition, the Senior Committee elects class officers to work with the Director of Alumni Relations.

Society for Advancement of Management

The Society for Advancement of Management is the recognized national professional organization of managers in industry, commerce, government and education. It has been dedicated to the advancement of management and managers since 1912, when the original Taylor Society was established. University Chapters operate in 190 leading colleges and universities in the United States, Canada, Puerto Rico, and Hawaii.

The University College Chapter is open to all Business students interested in furthering their growth and insight into the practice of the management profession.

The University College Student Chapter brings together executives in business and students in business, through meetings, conferences, and seminars, to serve as an effective medium for the exchange and distribution of information on the problems, policies, and methods of management and industry.

Sigma Epsilon Rho Honor Fraternity

Sigma Epsilon Rho is the honor fraternity of University College. Its purposes are:

To promote acquaintance and good fellowship among those men who have attained highest scholastic standing in the College.

To stimulate the student body to higher scholastic accomplishment through the bearing, influence and work of these selected men.

To develop methods of mutual improvement and advancement among the members of this fraternity.

To support high moral, professional and scholastic ideals.

Only honor graduates or seniors with honor standing at the end of the junior year are eligible for admission to the fraternity. Admission is by invitation after nomination by the fraternity.

An outstanding book is awarded each year by Sigma Epsilon Rho Fraternity to the highest ranking student at the conclusion of the junior year. Students will receive the award only in the event that they enroll for the subsequent year.

Pi Tau Kappa Fraternity

Pi Tau Kappa is a social fraternity open to University College students. It is organized to further the interests of University College students in their education, to promote closer affiliation between the student and the University, and to promote the social welfare of the University College student.

Kappa Tau Phi Sorority

Kappa Tau Phi Sorority is a social organization open to all evening women students. Its purpose is to promote fellowship among the women students so that they may become better acquainted and form a closer tie with the University. Monthly dinner meetings are held. Two scholarships are awarded annually to scholastically superior women students.

TUITION, FEES AND SCHOLARSHIPS

Tuition and fees are not transferable and are refundable only as stated under "Refund of Tuition."

Checks and drafts for all charges are to be drawn to the order of Northeastern University.

Application Fee

The University application fee of $10.00 must accompany the initial application for admission to the University. This fee is non-refundable.

Tuition

Tuition for all credit courses offered at the Boston Campus is charged at the rate of $22.00 per semester hour of credit. Charges for registration and tuition for special courses are at the rate and on the basis of payment specified for each course.

Tuition for all University College credit courses offered at the Suburban Campus of Northeastern University in Burlington is charged at the rate of $25.00 per semester hour of credit.

Tuition for all credit courses is charged on the semester basis payable at the beginning of each semester. As a convenience, however, the tuition each semester may be payable in two installments; the second installment is payable on November 15 and March 1 in the first and second semesters, respectively.

Tuition Budget Payment Plans

Occasionally situations develop — usually beyond the control of the student — which make it difficult to meet the payments in the manner outlined above. Under such circumstances the student is advised to discuss his problem personally with the Bursar's Office, where one of the budget plans or a deferred payment agreement may be worked out. Such arrangements should be made before the end of the first week of the semester or within one week of the date of registration if the student enters late. A charge of $2.00 will be made. Failure to take immediate action will result in a late payment fee of $5.00.

Tuition Underwritten by Employers

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases where payment is to be made directly by the employer to the University, the student should furnish to the Bursar's Office a purchase order covering his registration or a statement from an officer of his company certifying that the company is underwriting the tuition.

Late Payment Fee

Bills for tuition and fees are payable on or before Saturday of the week of issuance. A late payment fee of $5.00 is charged for all students failing to comply unless special payment arrangements are approved by the Bursar's Office.

Courses in Other Departments of the University

University College students assigned to courses in other departments of the University are charged the tuition rates and other fees effective in the departments to which they are enrolled.

Graduation Fee

The University graduation fee, charged to those who are candidates for the bachelor or associate degree, is $20.00, payable on or before May 1st of the year in which the student expects to graduate.

GENERAL FINANCIAL INFORMATION

Checks should be drawn payable to Northeastern University.

Students are not permitted to attend class sessions or take any examination or tests until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing, or permitted to re-enroll in the University, nor will degrees be conferred until all financial obligations to the University have been met.

No certificate of honorable dismissal will be issued to any student who has not fully met his financial obligations to the University.

Transcripts

Students may request transcripts of their grades at the University College Office. There is no charge for the first transcript. After the initial transcript, there is a charge of $1.00.

Statement of Tuition Refund Policy

The University provides all instruction and accommodations on an academic semester basis; therefore, no refunds are granted except in cases where students are compelled to withdraw because of personal illness or other reasons beyond their control. In no event will a refund be made

if individual's attendance is recorded beyond the fifth class session. A student must complete an official withdrawal application before being considered for refund. Questions regarding refunds should be discussed with the Bursar's Office.

SCHOLARSHIPS, AWARDS AND LOAN FUNDS

The following scholarships and awards are available to students enrolled in University College.

The Clarkson Alumni Award

This award, made available through the Alumni Association of University College, is in memory of George S. Clarkson, a member of the Class of 1914 and an instructor in Accounting for many years. This award, which is indeterminate in amount, is granted to the student who obtains the highest cumulative average in the Accounting curricula at the close of his junior year. To be eligible, the student must have completed 30 semester hours of credit in residence in Accounting courses. If he is eligible for an award of greater monetary value, the Clarkson Alumni Award will be made to the next highest ranking student who is eligible. To be eligible for this scholarship the student must pursue a normal schedule the following year.

Dean Russell Whitney Memorial Scholarship

Alpha Chapter of the Pi Tau Kappa Fraternity sponsors an annual tuition scholarship in memory of former Dean Russell Whitney. The award is made available to the man in University College whose qualities of leadership and influence among his fellow students, whose strength of character, and whose record of scholarship and broad achievement mark him as outstanding. The award is made available to the student who has completed a minimum of 60 semester hours. To be eligible for this scholarship the student must pursue a normal schedule during the year in which the award is made.

Kappa Tau Phi Scholarship

Kappa Tau Phi Sorority annually makes available two scholarship awards. They are granted to the women students in Liberal Arts and Business programs, respectively, who rank highest in their class at the end of the upper-middler year. In the event the student is eligible for an award of greater monetary value, the award will be made to the next highest ranking woman student. To be eligible for this scholarship, the student must be enrolled in a program of at least two evenings per week and must be a candidate for the bachelor's degree. In determining this award, grades of all courses completed in prior years shall be considered.

Harry Olins Scholarship

The Harry Olins Scholarship Fund was established as an expression of firm belief in University College students and "what they stand for." The fund, presented by Mrs. Harry Olins in recognition of her husband's long service on the faculty, makes available an annual tuition award to that

student who in terms of scholastic achievement, character, and personal need best typifies the spirit of Northeastern University.

To be eligible for this award the student must be a degree candidate and carry a full academic load during the school year.

Traffic Club of New England Scholarship

The Traffic Club of New England provides six scholarships annually for persons employed in the field of transportation and traffic management. Each scholarship covers tuition, books, and incidental expenses involved in the two courses, "Transportation Practices" and "Traffic Management." The objective of the scholarship is to introduce six new persons annually to education in the field of transportation and traffic management, after which it is assumed that they will continue for the complete program at their own expense. Two students each will be selected from carrier traffic departments and industrial traffic departments annually. The scholarship proposals are administered cooperatively with the Scholarship Committee of the Traffic Club of New England. Applications for the scholarships must be secured from and filed with the Secretary, The Traffic Club of New England, 210 Lincoln Street, Boston, Massachusetts.

Pilot Freight Carriers Scholarship

Pilot Freight Carriers, Winston-Salem, N.C., awards $500.00 annually to an advanced transportation student who has achieved high academic standing and who has paid his tuition expenses without prior aid. The award may be shared by more than one student. Potential recipients are designated by the Director of the Transportation Institute, and a final determination is made by the Dean of University College.

Sigma Epsilon Rho Scholarship

This scholarship is given to the highest ranking student in University College at the end of his junior year.

Programs of Instruction

University College conducts educational programs on the undergraduate level. The programs are designed to meet the varying needs of students attending evening college and are represented in four main groups.

1. The Bachelor of Science Degree (B.S.) requires 130 semester hours of credit.

2. The Associate Degree requires 72 semester hours of credit.

3. Certificates may be earned with a minimum of 30 semester hours of credit.

4. Single courses or special programs are available for the special student.

BACHELOR DEGREE PROGRAMS

University College programs leading to the Bachelor of Science Degree provide opportunities for cultural and professional development equivalent in quality and scope to those offered in the conventional four-year college enrolling full-time students.

Bachelor of Science Degree curricula are offered in the following fields:

I. Business Administration

II. Liberal Arts

III. Law Enforcement and Security

IV. Health Sciences

Associate Degree Programs

Programs leading to the Associate in Science Degree are offered for those who wish to obtain a background in the fundamental area of business or the arts. The Associate Degree requires completion of a minimum of 72 semester hours of credit in course.

Associate in Science Degree curricula are offered in the following fields:

Certificate Programs

Certificate programs may be arranged for those who wish to obtain a degree of proficiency in one of several areas of study without meeting the longer requirements for an associate or bachelor's degree. Certificate programs carry a requirement of 30 semester hours in the desired specialty and related courses and may be arranged by a representative from the Dean's Office. Credits earned in Certificate programs may be applied toward the associate or bachelor's degree.

ACCOUNTING

Bachelor of Science Degree

semester hours

Core Courses — required				44
Business Management:				
	45.601	Introduction to Management	2	
	45.602	Functions of Management	2	
Economics:				
20.601, 20.602		Economic Principles and Problems	4	
	20.603	Money and Banking	2	
	20.604	Financial Organization and Management	2	
20.605, 20.606		Financial Policies and Planning	4	
English:				
30.601, 30.602		English	4	
	30.603	Introduction to Literature	2 ⎫	
	30.604	Business Writing	2 ⎪ 4	
	30.605	Business Reports	2 ⎬	
	30.606	Technical Writing I	2 ⎭	
Industrial Relations:				
	42.610	Labor Management Relations	2	
Law:				
	46.601	Law I	2	
	46.602	Law II	2	
	46.603	Law III	2	
Marketing:				
43.601, 43.602		Principles of Marketing	4	
Mathematics:				
14.601, 14.602		Mathematics	4	
Statistics:				
20.610, 20.611		Management Statistics OR ⎫		
5.617, 5.618		Quality Control Statistics ⎬	4	

Liberal Content — required			24
82.601, 82.602	Man and His Physical Universe	6	
82.603, 82.604	Man and Society	6	
82.605, 82.606	Man's Cultural Inheritance	6	
82.607, 82.608	Man and Values	6	

Professional Courses — required			39
41.601, 41.602	Introductory Accounting	4	
41.603, 41.604	Intermediate Accounting	4	
41.605, 41.606	Accounting Problems	4	
41.607, 41.608	Advanced Accounting Problems	4	
41.610	Mathematics of Accounting	2	
41.611, 41.612	Cost Accounting	4	
41.617, 41.618	Auditing or Internal Auditing	4	
41.623, 41.624	Basic Federal Taxation	4	
41.620, 41.621	Controllership	4	
81.601	Electronic Data Processing	3	
41.641	Accounting Seminar	2	

Elective Courses		23
	Total hours required for degree	130

The student in Accounting will not be allowed to count more than 8 hours in Accounting electives toward meeting the degree requiremnts.

BUSINESS MANAGEMENT   **Bachelor of Science Degree**

semester hours

Core Courses — required			**44**
Business Management:			
	45.601	Introduction to Management	2
	45.602	Functions of Management	2
Economics:			
20.601, 20.602		Economic Principles and Problems	4
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
20.605, 20.606		Financial Policies and Planning	4
English:			
30.601, 30.602		English	4
	30.603	Introduction to Literature	2 ⎫
	30.604	Business Writing	2 ⎪ 4
	30.605	Business Reports	2 ⎬
	30.606	Technical Writing I	2 ⎭
Industrial Relations:			
	42.610	Labor Management Relations	2
Law:			
	46.601	Law I	2
	46.602	Law II	2
	46.603	Law III	2
Marketing:			
43.601, 43.602		Principles of Marketing	4
Mathematics:			
14.601, 14.602		Mathematics	4
Statistics:			
20.610, 20.611		Management Statistics OR ⎫	4
5.617, 5.618		Quality Control Statistics ⎬	

Liberal Content — required		**24**
82.601, 82.602	Man and His Physical Universe	6
82.603, 82.604	Man and Society	6
82.605, 82.606	Man's Cultural Inheritance	6
82.607, 82.608	Man and Values	6

Professional Courses — required		**34**
41.628, 41.629	Managerial Accounting	4
41.630, 41.631	Accounting for Management Decisions	4
20.621	Credit Fundamentals	2
20.609	Government Controls in Business	2
20.612	Statistical Methods in Forecasting	2
20.641, 20.642	Business Planning and Research	4
5.601, 5.602	Industrial Management	4
45.610	Office Management Practices	2
44.603	Insurance for Management	2
42.601	Introduction to Psychology for Management	2
42.602, 42.603	Human Relations	4
45.641	Management Seminar	2

Elective Courses	**28**
Total hours required for degree	**130**

FINANCE   **Bachelor of Science Degree**

			semester hours
Core Courses — required			**44**
Business Management:			
	45.601	Introduction to Management	2
	45.602	Functions of Management	2
Economics:			
20.601, 20.602		Economic Principles and Problems	4
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
20.605, 20.606		Financial Policies and Planning	4
English:			
30.601, 30.602		English	4
	30.603	Introduction to Literature	2 ⎫
	30.604	Business Writing	2 ⎬ 4
	30.605	Business Reports	2 ⎪
	30.606	Technical Writing I	2 ⎭
Industrial Relations:			
	42.610	Labor Management Relations	2
Law:			
	46.601	Law I	2
	46.602	Law II	2
	46.603	Law III	2
Marketing:			
43.601, 43.602		Principles of Marketing	4
Mathematics:			
14.601, 14.602		Mathematics	4
Statistics:			
20.610, 20.611		Management Statistics OR ⎫	
5.617, 5.618		Quality Control Statistics ⎬	4
Liberal Content — required			**24**
82.601, 82.602		Man and His Physical Universe	6
82.603, 82.604		Man and Society	6
82.605, 82.606		Man's Cultural Inheritance	6
82.607, 82.608		Man and Values	6
Professional Courses — required			**28**
41.628, 41.629		Managerial Accounting	4
	41.619	Analysis of Financial Statements	2
	20.621	Credit Fundamentals	2
	20.622	Credit Problems	2
	20.607	Investment Principles	2
	20.612	Statistical Methods in Forecasting	2
	20.616	International Economics	2
	20.617	Monetary Policy	2
20.641, 20.642		Business Planning and Research	4
44.601, 44.602		Insurance Principles	4
	20.624	Personal Finance	2
Elective Courses			**34**
		Total hours required for degree	**130**

INDUSTRIAL MANAGEMENT   Bachelor of Science Degree

semester hours

Core Courses — required   **44**

Business Management:
| | 45.601 | Introduction to Management | 2 |
| | 45.602 | Functions of Management | 2 |

Economics:
20.601, 20.602	Economic Principles and Problems	4
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
20.605, 20.606	Financial Policies and Planning	4

English:
30.601, 30.602	English	4
	30.603	Introduction to Literature	2
	30.604	Business Writing	2
	30.605	Business Reports	2
	30.606	Technical Writing I	2

(30.603–30.606 bracketed) 4

Industrial Relations:
| | 42.610 | Labor Management Relations | 2 |

Law:
	46.601	Law I	2
	46.602	Law II	2
	46.603	Law III	2

Marketing:
| 43.601, 43.602 | Principles of Marketing | 4 |

Mathematics:
| 14.601, 14.602 | Mathematics | 4 |

Statistics:
| 20.610, 20.611 | Management Statistics OR | |
| 5.617, 5.618 | Quality Control Statistics | 4 |

Liberal Content — required   **24**

82.601, 82.602	Man and His Physical Universe	6
82.603, 82.604	Man and Society	6
82.605, 82.606	Man's Cultural Inheritance	6
82.607, 82.608	Man and Values	6

Professional Courses — required   **32**

41.628, 41.629	Managerial Accounting	4
41.630, 41.631	Accounting for Management Decisions	4
5.605, 5.606	Work Simplification	4
5.607	Work Measurement	2
5.623, 5.624	Plant Layout	4
5.601, 5.602	Industrial Management	4
5.604	Production Processes	2
42.601	Introduction to Psychology for Management	2
42.602, 42.603	Human Relations	4
5.645	Manufacturing Seminar	2

Elective Courses   **30**

Total hours required for degree   **130**

INSURANCE   **Bachelor of Science Degree**

			semester hours
Core Courses — required			**44**
Business Management:			
	45.601	Introduction to Management	2
	45.602	Functions of Management	2
Economics:			
20.601, 20.602		Economic Principles and Problems	4
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
20.605, 20.606		Financial Policies and Planning	4
English:			
30.601, 30.602		English	4
	30.603	Introduction to Literature	2 ⎫
	30.604	Business Writing	2 ⎬ 4
	30.605	Business Reports	2
	30.606	Technical Writing I	2 ⎭
Industrial Relations:			
	42.610	Labor Management Relations	2
Law:			
	46.601	Law I	2
	46.602	Law II	2
	46.603	Law III	2
Marketing:			
43.601, 43.602		Principles of Marketing	4
Mathematics:			
14.601, 14.602		Mathematics	4
Statistics:			
20.610, 20.611		Management Statistics OR ⎱	4
5.617, 5.618		Quality Control Statistics ⎰	
Liberal Content — required			**24**
82.601, 82.602		Man and His Physical Universe	6
82.603, 82.604		Man and Society	6
82.605, 82.606		Man's Cultural Inheritance	6
82.607, 82.608		Man and Values	6
Professional Courses — required			**28**
41.628, 41.629		Managerial Accounting	4
44.601, 44.602		Insurance Principles	4
44.609, 44.610		Life Insurance	4
44.604, 44.605		Casualty Insurance	4
44.611, 44.612		Property Insurance	4
	44.606	Insurance Law	2
	44.608	Rates and Rate Making	2
	42.601	Introduction to Psychology for Management	2
	20.624	Personal Finance	2
Elective Courses			**34**
		Total hours required for degree	**130**

MARKETING   **Bachelor of Science Degree**

			semester hours
Core Courses — required			**44**
Business Management:			
	45.601	Introduction to Management	2
	45.602	Functions of Management	2
Economics:			
20.601, 20.602		Economic Principles and Problems	4
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
20.605, 20.606		Financial Policies and Planning	4
English:			
30.601, 30.602		English	4
	30.603	Introduction to Literature	2 ⎫
	30.604	Business Writing	2 ⎬ 4
	30.605	Business Reports	2 ⎪
	30.606	Technical Writing I	2 ⎭
Industrial Relations:			
	42.610	Labor Management Relations	2
Law:			
	46.601	Law I	2
	46.602	Law II	2
	46.603	Law III	2
Marketing:			
43.601, 43.602		Principles of Marketing	4
Mathematics:			
14.601, 14.602		Mathematics	4
Statistics:			
20.610, 20.611		Management Statistics OR ⎫	
5.617, 5.618		Quality Control Statistics ⎬	4
Liberal Content — required			**24**
82.601, 82.602		Man and His Physical Universe	6
82.603, 82.604		Man and Society	6
82.605, 82.606		Man's Cultural Inheritance	6
82.607, 82.608		Man and Values	6
Professional Courses — required			**28**
41.628, 41.629		Managerial Accounting	4
	43.603	Principles of Salesmanship	2
	43.605	Sales Promotion	2
	43.613	Market Research	2
43.608, 43.609		Principles of Advertising	4
20.625, 20.626		Foreign Trade	4
	20.621	Credit Fundamentals	2
	20.608	Economic Geography	2
	20.612	Statistical Methods in Forecasting	2
	43.615	Purchasing I	2
	43.641	Marketing Management Seminar	2
Elective Courses			**34**
		Total hours required for degree	**130**

PERSONNEL AND INDUSTRIAL RELATIONS   **Bachelor of Science Degree**

semester hours

Core Courses — required — 44

Business Management:

	45.601	Introduction to Management	2
	45.602	Functions of Management	2

Economics:

20.601, 20.602		Economic Principles and Problems	4
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
20.605, 20.606		Financial Policies and Planning	4

English:

30.601, 30.602		English		4
	30.603	Introduction to Literature	2	
	30.604	Business Writing	2	4
	30.605	Business Reports	2	
	30.606	Technical Writing I	2	

Industrial Relations:

	42.610	Labor Management Relations	2

Law:

	46.601	Law I	2
	46.602	Law II	2
	46.603	Law III	2

Marketing:

43.601, 43.602	Principles of Marketing	4

Mathematics:

14.601, 14.602	Mathematics	4

Statistics:

20.610, 20.611	Management Statistics OR		4
5.617, 5.618	Quality Control Statistics		

Liberal Content — required — 24

82.601, 82.602	Man and His Physical Universe	6
82.603, 82.604	Man and Society	6
82.605, 82.606	Man's Cultural Inheritance	6
82.607, 82.608	Man and Values	6

Professional Courses — required — 34

41.628, 41.629		Managerial Accounting	4
5.605, 5.606		Work Simplification	4
	5.607	Work Measurement	2
	5.609	Job Analysis and Evaluation	2
	42.601	Introduction to Psychology for Management	2
42.602, 42.603		Human Relations	4
	42.604	Personnel Management Practices	2
	42.605	Wage Administration	2
	42.606	Employment Testing	2
	42.607	Practical Training Methods	2
	42.611	Labor Legislation — Union-Management Relations	2
	42.613	Labor Legislation — Conditions of Employment	2
	42.614	Labor Agreement	2
	42.641	Labor Relations Seminar	2

Elective Courses — 28

Total hours required for degree — 130

INDUSTRIAL TECHNOLOGY   Bachelor of Science Degree

The Industrial Technology curriculum combines fundamental courses in one of several areas of engineering technology with an integrated program in management, the humanities, and the social sciences to provide background for those who aspire to positions of managerial responsibility where technical knowledge is required.

The curriculum is offered by University College in conjunction with Lincoln College, one of the schools of Northeastern University. Graduates of Lincoln College or other technical schools who have been awarded the Associate Degree are granted sixty hours credit toward the Bachelor of Science Degree. The technology requirements may also be earned by satisfactory completion of equivalent technology courses in an accredited engineering college or technical institute.

The total requirements for the degree are 130 semester hours distributed as follows:

			semester hours
Engineering Technology Courses			**60**
Management Courses — required			**36**
30.601,	30.602	English	4
41.628,	41.629	Managerial Accounting	4
20.601,	20.602	Economic Principles and Problems	4
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
	45.601	Introduction to Management	2
5.601,	5.602	Industrial Management	4
43.601,	43.602	Principles of Marketing	4
	42.610	Labor Management Relations	2
5.617,	5.618	Quality Control Statistics	4
46.605,	46.606	Law for Engineers	4
Liberal Content — required			**24**
82.601,	82.602	Man and His Physical Universe	6
82.603,	82.604	Man and Society	6
82.605,	82.606	Man's Cultural Inheritance	6
82.607,	82.608	Man and Values	6
Management Courses — electives			**10**
		Total hours required for degree	**130**

Courses for elective credit may be selected from the course offerings of University College, provided prerequisite requirements have been met. University College will also award 10 semester hours elective credit for courses completed in Control Systems Engineering Technology, offered through Lincoln College.

ACCOUNTING
Associate in Science Degree

			semester hours
Core Courses — required			**30**
Business Management:			
	45.601	Introduction to Management	2
Economics:			
	20.601, 20.602	Economic Principles and Problems	4
English:			
	30.601, 30.602	English	4
Law:			
	46.601, 46.602	Law I, II	4
Marketing:			
	43.601, 43.602	Principles of Marketing	4
Mathematics:			
	14.601, 14.602	Mathematics	4
Statistics:			
	20.610, 20.611	Management Statistics	4
Accounting:			
	41.601, 41.602	Introductory Accounting	4
Professional Courses — required			**26**
	41.603, 41.604	Intermediate Accounting	4
	41.605, 41.606	Accounting Problems	4
	41.607, 41.608	Advanced Accounting Problems	4
	41.610	Mathematics of Accounting	2
	41.611, 41.612	Cost Accounting	4
	41.617, 41.618	Auditing or Internal Auditing	4
	41.623, 41.624	Basic Federal Taxation	4
Elective Courses			**16**
		Total hours required for degree	**72**

BUSINESS MANAGEMENT   Associate in Science Degree

			semester hours
Core Courses — required			**30**
20.605, 20.606	Financial Policies and Planning		4
Business Management:			
45.601	Introduction to Management		2
Economics:			
20.601, 20.602	Economic Principles and Problems		4
English:			
30.601, 30.602	English		4
Law:			
46.601, 46.602	Law I, II		4
Marketing:			
43.601, 43.602	Principles of Marketing		4
Mathematics:			
14.601, 14.602	Mathematics		4
Statistics:			
20.610, 20.611	Management Statistics		4
Accounting:			
41.628, 41.629	Managerial Accounting		4
20.603	Money and Banking		2
Professional Courses — required			**28**
30.603	Introduction to Literature	2 ⎫	
30.604	Business Writing	2 ⎬ 4	
30.605	Business Reports	2	
30.606	Technical Writing I	2 ⎭	
20.603	Money and Banking		2
20.604	Financial Organization and Management		2
20.605, 20.606	Financial Policies and Planning		4
42.610	Labor Management Relations		2
46.603, 46.604	Legal Aspects of Business II		4
5.601, 5.602	Industrial Management		4
42.601	Introduction to Psychology for Management		2
42.602, 42.603	Human Relations		4
Elective Courses			**14**
	Total hours required for degree		**72**

ELECTRONIC DATA PROCESSING   Associate in Science Degree

			semester hours
Core Courses — required			**30**
Business Management:			
	45.601	Introduction to Management	2
Economics:			
20.601, 20.602		Economic Principles and Problems	4
English:			
30.601, 30.602		English	4
Law:			
46.601, 46.602		Law I, II	4
Marketing:			
43.601, 43.602		Principles of Marketing	4
Mathematics:			
14.601, 14.602		Mathematics	4
Statistics:			
20.610, 20.611		Management Statistics	4
Accounting:			
41.628, 41.629		Managerial Accounting	4
Professional Courses — required			**28**
	81.601	Electronic Data Processing	3
	81.602	Basic Computer Programming	3
	81.603	Advanced Computer Programming	2
	81.606	Data Systems Administration	2
	81.605	Business Data Processing Applications	2
	81.604	Advanced Programming Systems	2
	83.603	Office Systems and Procedures	2
	20.614	Statistics for Business Decisions	2
	41.622	Punch Card Accounting	2
	81.608	Introduction to Operations Research	2
	81.609	Operations Research Applications	2
14.603, 14.604		Mathematics for Scientific Business Management	4
Elective Courses			**14**
		Total hours required for degree	**72**

FINANCE   **Associate in Science Degree**

			semester hours
Core Courses — required			**30**
Business Management:			
	45.601	Introduction to Management	2
Economics:			
20.601,	20.602	Economic Principles and Problems	4
English:			
30.601,	30.602	English	4
Law:			
46.601,	46.602	Law I, II	4
Marketing:			
43.601,	43.602	Principles of Marketing	4
Mathematics:			
14.601,	14.602	Mathematics	4
Statistics:			
20.610,	20.611	Management Statistics	4
Accounting:			
41.628,	41.629	Managerial Accounting	4
Professional Courses — required			**24**
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
20.605,	20.606	Financial Policies and Planning	4
	20.621	Credit Fundamentals	2
	20.622	Credit Problems	2
	20.607	Investment Principles	2
	20.616	International Economics	2
	20.624	Personal Finance	2
44.601,	44.602	Insurance Principles	4
	41.619	Analysis of Financial Statements	2
Elective Courses			<u>**18**</u>
		Total hours required for degree	<u>72</u>

INDUSTRIAL MANAGEMENT   Associate in Science Degree

			semester hours
Core Courses — required			**30**
Business Management:			
	45.601	Introduction to Management	2
Economics:			
20.601,	20.602	Economic Principles and Problems	4
English:			
30.601,	30.602	English	4
Law:			
46.601,	46.602	Law I, II	4
Marketing:			
43.601,	43.602	Principles of Marketing	4
Mathematics:			
14.601,	14.602	Mathematics	4
Statistics:			
20.610,	20.611	Management Statistics OR	4
5.617,	5.618	Quality Control Statistics	
Accounting:			
41.628,	41.629	Managerial Accounting	4
Professional Courses — required			**24**
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
	42.610	Labor Management Relations	2
5.601,	5.602	Industrial Management	4
5.605,	5.606	Work Simplification	4
	5.607	Work Measurement	2
	5.604	Production Processes	2
	42.601	Introduction to Psychology for Management	2
42.602,	42.603	Human Relations	4
Elective Courses			**18**
		Total hours required for degree	**72**

INSURANCE   Associate in Science Degree

		semester hours
Core Courses — required		**30**
Business Management:		
45.601	Introduction to Management	2
Economics:		
20.601, 20.602	Economic Principles and Problems	4
English:		
30.601, 30.602	English	4
Law:		
46.601, 46.602	Law I, II	4
Marketing:		
43.601, 43.602	Principles of Marketing	4
Mathematics:		
14.601, 14.602	Mathematics	4
Statistics:		
20.610, 20.611	Management Statistics	4
Accounting:		
41.628, 41.629	Managerial Accounting	4
Professional Courses — required		**28**
20.603	Money and Banking	2
20.604	Financial Organization and Management	2
44.601, 44.602	Insurance Principles	4
44.609, 44.610	Life Insurance	4
44.604, 44.605	Casualty Insurance	4
44.611, 44.612	Property Insurance	4
44.606	Insurance Law	2
44.608	Rates and Rate Making	2
42.601	Introduction to Psychology for Management	2
20.624	Personal Finance	2
Elective Courses		**14**
	Total hours required for degree	**72**

MARKETING   **Associate in Science Degree**

			semester hours
Core Courses — required			**30**
Business Management:			
	45.601	Introduction to Management	2
Economics:			
20.601, 20.602		Economic Principles and Problems	4
English:			
30.601, 30.602		English	4
Law:			
46.601, 46.602		Law I, II	4
Marketing:			
43.601, 43.602		Principles of Marketing	4
Mathematics:			
14.601, 14.602		Mathematics	4
Statistics:			
20.610, 20.611		Management Statistics	4
Accounting:			
41.628, 41.629		Managerial Accounting	4
Professional Courses — required			**24**
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
	42.610	Labor Management Relations	2
	43.603	Principles of Salesmanship	2
	43.605	Sales Promotion	2
	43.613	Market Research	2
43.608, 43.609		Principles of Advertising	4
20.625, 20.626		Foreign Trade	4
	20.621	Credit Fundamentals	2
	20.608	Economic Geography	2
Elective Courses			18
		Total hours required for degree	72

PERSONNEL AND INDUSTRIAL RELATIONS   Associate in Science Degree

			semester hours
Core Courses — required			**30**
Business Management:			
	45.601	Introduction to Management	2
Economics:			
20.601,	20.602	Economic Principles and Problems	4
English:			
30.601,	30.602	English	4
Law:			
46.601,	46.602	Law I, II	4
Marketing:			
43.601,	43.602	Principles of Marketing	4
Mathematics:			
14.601,	14.602	Mathematics	4
Statistics:			
20.610,	20.611	Management Statistics	4
Accounting:			
41.628,	41.629	Managerial Accounting	4
Professional Courses — required			**30**
	42.610	Labor Management Relations	2
	42.601	Introduction to Psychology for Management	2
42.602,	42.603	Human Relations	4
	42.604	Personnel Management Practices	2
5.605,	5.606	Work Simplification	4
	5.607	Work Measurement	2
	5.609	Job Analysis and Evaluation	2
	42.605	Wage Administration	2
	42.607	Practical Training Methods	2
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
	42.611	Labor Legislation — Union-Management Relations	2
	42.612	Labor Legislation — Conditions of Employment	2
Elective Courses			$\underline{12}$
		Total hours required for degree	$\overline{72}$

PURCHASING   **Associate in Science Degree**

semester hours

Core Courses — required   30

Business Management:

    45.601   Introduction to Management   2

Economics:

    20.601, 20.602   Economic Principles and Problems   4

English:

    30.601, 30.602   English   4

Law:

    46.601, 46.602   Law I, II   4

Marketing:

    43.601, 43.602   Principles of Marketing   4

Mathematics:

    14.601, 14.602   Mathematics   4

Statistics:

    20.610, 20.611   Management Statistics   4

Accounting:

    41.628, 41.629   Managerial Accounting   4

Professional Courses — required   24

    43.615   Purchasing I   2

    43.616   Purchasing II   2

  5.601, 5.602   Industrial Management   4

    5.604   Production Processes   2

    5.610   Materials of Production   2

    43.612   Industrial Marketing   2

    42.601   Introduction to Psychology for Management   2

  42.602, 42.603   Human Relations   4

    45.610   Office Management Practices   2

    43.603   Principles of Salesmanship   2

Elective Courses   <u>18</u>

    Total hours required for degree   <u>72</u>

Twelve semester hours may be elected, with approval of the Dean or advisor, from the offerings at Lincoln College for which the student meets course requirements.

REAL ESTATE   **Associate in Science Degree**

		semester hours
Core Courses — required		**30**
Business Management:		
45.601	Introduction to Management	2
Economics:		
20.601, 20.602	Economic Principles and Problems	4
English:		
30.601, 30.602	English	4
Law:		
46.601, 46.602	Law I, II	4
Marketing:		
43.601, 43.602	Principles of Marketing	4
Mathematics:		
14.601, 14.602	Mathematics	4
Statistics:		
20.610, 20.611	Management Statistics	4
Accounting:		
41.628, 41.629	Managerial Accounting	4
Professional Courses — required		**22**
84.601	Real Estate Fundamentals	2
84.602	Real Estate Law	2
84.603	Real Estate Investment	2
84.604	Real Estate Management	2
84.605	Real Estate Finance	2
84.606	Real Estate Sales and Operations	2
84.607	Residential Real Estate	2
84.608	Commercial Properties	2
84.609	Industrial Properties	2
84.610	Real Estate Appraisal	2
84.611	Real Estate Market Research	2
Elective Courses		**20**
	Total hours required for degree	**72**

TRAFFIC MANAGEMENT   **Associate in Science Degree**

			semester hours
Core Courses — required			**30**
Business Management:			
	45.601	Introduction to Management	2
Economics:			
20.601, 20.602		Economic Principles and Problems	4
English:			
30.601, 30.602		English	4
Law:			
46.601, 46.602		Law I, II	4
Marketing:			
43.601, 43.602		Principles of Marketing	4
Mathematics:			
14.601, 14.602		Mathematics	4
Statistics:			
20.610, 20.611		Management Statistics	4
Accounting:			
41.628, 41.629		Managerial Accounting	4
Professional Courses — required			**32**
	85.608	Motor Carrier Operations	2
	85.601	Traffic Management I	2
	85.602	Traffic Management II	2
	85.603	Advanced Traffic Management Problems	2
85.606, 85.607		ICC Practices and Procedures	4
	85.609	Freight Claims	2
85.610, 85.611		Rates, Tariffs, and Pricing	4
	85.612	Distribution and Warehousing	2
	85.615	Urban Transportation	2
	43.615	Purchasing I	2
5.601, 5.602		Industrial Management	4
	42.610	Labor Management Relations	2
	30.607	Effective Speaking	2
Elective Courses			**10**
		Total hours required for degree	**72**

The
Liberal Arts

Aims

In providing the means to a modern liberal arts education, University College of Northeastern University has a threefold objective: first the development of intellectual capability; second, the development of a well-rounded personality; and third, preparation for a career.

Intellectual capability rests upon the foundation of a sound general education. Through the required and elective courses of all curricula, students are guided toward a mastery of the leading ideas, significant facts, and the habits of thought and methods of work in the areas of language, natural science, social science, and the humanities. With this training the student will better understand the world and society in which he lives, appreciate more fully the basic values upon which civilization and culture rest, and perceive and accept his responsibilities as an active participant in social groups — the family, the community, the nation and the world. At the same time the student is aided in the development of a resourceful and independent mind, the ability to use as well as to accumulate knowledge, and the awareness of his mental strengths and weaknesses.

University College endeavors to assist each student of the liberal arts in attaining the goal of an emotionally balanced, well-rounded personality. Its academic and extracurricular programs provide experiences conducive to the development of strength of character and a sense of personal responsibility — including such personal qualities as self-reliance, integrity, perseverance, and the ability to work with others.

Since liberal arts colleges were originally established for the purpose of training for certain professions, the College holds that there is no inconsistency between a truly liberal education and preparation for a career. Today it is widely accepted that a liberal education must prepare both for the art of living and the obtaining of a living.

Methods

To enable each student to plan a college program in keeping with his own interests and aptitudes, a wide range of electives is offered. This does not mean that students are free to elect courses indiscriminately, for if they are to obtain a liberal education they must have training in several basic fields. Therefore, the Faculty Committee on Education has established basic minimum requirements in each of several fields. These distribution requirements are outlined with each of the program offerings.

Programs of Instruction

To achieve the aims established for the Evening Programs in Liberal Arts, of serving men and women who are engaged in full-time employment during the day, the College offers curricula leading to the baccalaureate and associate degrees. The various individual courses of study are outlined on the following pages of this catalog. Course descriptions are included by departments beginning on page 71.

The Bachelor of Science Degree

Major fields of study are offered in Economics, English, History-Government, and Sociology. Each student will choose a minor field in consultation with a counselor.

The distribution requirements, including certain required courses, are shown with each curriculum. Upon petition, students may be permitted in certain cases to substitute other courses which will more adequately serve their specific career objectives.

Each curriculum normally provides for not less than 130 semester hours of work, including at least 30 semester hours of advanced work in a major field, and at least 15 semester hours of prescribed or elective courses in a related minor field.

All candidates for this degree must have satisfactorily completed in college one year of a modern language above the elementary level.

No student transferring from another college or university is eligible to receive a degree until at least 30 semester hours of academic work have been completed at Northeastern University immediately preceding graduation.

ART HISTORY   **Bachelor of Science Degree**

			semester hours
Core Courses — required			**70**
Economics:			
20.601,	20.602	Economic Principles and Problems	4
English:			
30.601,	30.602	English	4
Fine Arts:			
	27.601	Introduction to the Arts	2
	28.601	Introduction to Music	2
Government:			
22.601,	22.602	American Government	4
22.603,	22.604	Comparative Government	4
History:			
23.601,	23.604	History of Civilization	8
		*Courses approved by the Dean	4
Literature:			
	30.603	Introduction to Literature	2
		*Courses approved by the Dean	8
**Modern Languages:			
		Elementary	4
		Intermediate	4
Philosophy:			
24.601,	24.602	Introduction to Philosophy	4
	24.605	Philosophy of Art	2
Psychology:			
25.601,	25.602	General Psychology	4
Science:			
	82.601	Survey of Physical Sciences	3
	82.602	Survey of Biological Sciences	3
Sociology:			
36.601,	36.602	Principles of Sociology	4

Major Concentration Courses — required   30

27.602, 27.603	General Survey of Western Art	4
27.643	Art Seminar (senior level)	2

In addition to the two courses above, required of all Art History majors, each student will select a minimum of 24 hours from the following areas with the provision that at least two courses must be completed from each area.

Area I

27.607	History of Ancient Art	2
27.608	History of Medieval Art	2
27.604	Ancient Architecture	2
27.605	Medieval Architecture	2

Area III

27.623	Oriental Art I (China & Japan)	2
27.624	Oriental Art II (India)	2
27.625	Russian Art	2
27.626	African Art	2
27.627	American Indian Art	2

Art II

27.621	History of American Art I	2
27.622	History of American Art II	2
27.609	Modern Painting	2
27.606	Modern Architecture	2

Area IV

27.612	European Art	2
27.613	Italian Renaissance Art	2
27.614	Spanish Art	2
27.615	French Art	2
27.616	English Art	2

Minor Concentration Courses*** — required   15

Elective Courses   15

Total hours required for degree   130

*Courses approved by the Dean — Students will consult with the Dean or other qualified administrative personnel before registering for any courses not specified within the curriculum.

**One full year of a modern language beyond the elementary level is a requirement for graduation.

***A minor consisting of a minimum of 15 semester hours of credit in a related field will be selected by the student in consultation with the Dean.

ECONOMICS   **Bachelor of Science Degree**

			semester hours
Core Courses — required			**68**
Economics:			
20.601, 20.602	Economic Principles and Problems		4
English:			
30.601, 30.602	English		4
Fine Arts:	*Art or Music		4
Government:			
22.601, 22.602	American Government		4
	*Courses approved by the Dean		4
History:			
23.601-604	History of Civilization		8
	*Courses Approved by the Dean		4
Literature:			
30.603	Introduction to Literature		2
	*Courses approved by the Dean		8
**Modern Language:			
	Elementary		4
	Intermediate		4
Philosophy:			
24.601, 24.602	Introduction to Philosophy		4
Psychology:			
25.601, 25.602	General Psychology		4
Science:			
82.601	Survey of Physical Sciences		3
82.602	Survey of Biological Sciences		3
Sociology:			
36.601, 36.602	Principles of Sociology		4
Major Concentration Courses — required			**30**
41.628, 41.629	Managerial Accounting		4
20.603	Money and Banking		2
20.604	Financial Organization and Management		2
20.605, 20.606	Financial Policies and Planning		4
20.608	Economic Geography		2
20.609	Government Controls in Business		2
20.610, 20.611	Management Statistics		4
20.616	International Economics		2
20.618, 20.619	Business Planning and Research		4
	*Economic Theory Courses		4
Minor Concentration Courses* — required**			**15**
Elective Courses			**17**
	Total hours required for degree		**130**

*,**,*** — For explanation see bottom of page 57.

ENGLISH   **Bachelor of Science Degree**

			semester hours
Core Courses — required			**68**
Economics:			
20.601, 20.602	Economic Principles and Problems	4	
English:			
30.601, 30.602	English	4	
Fine Arts:	*Art or Music	4	
Government:			
22.601, 22.602	American Government	4	
	*Courses approved by the Dean	4	
History:			
23.601, 23.604	History of Civilization	8	
	*Courses approved by the Dean	4	
Literature:			
30.603	Introduction to Literature	2	
30.621, 30.622	Western World Literature I	4	
30.623, 30.624	Western World Literature II	4	
**Modern Language:			
	Elementary	4	
	Intermediate	4	
Philosophy:			
24.601, 24.602	Introduction to Philosophy	4	
Psychology:			
25.601, 25.602	General Psychology	4	
Science:			
82.601	Survey of Physical Sciences	3	
82.602	Survey of Biological Sciences	3	
Sociology:			
36.601, 36.602	Principles of Sociology	4	

Major Concentration Courses — required			**30**
30.608	Advanced Composition	2	
30.610	The English Language	2	
30.611	Introduction to Semantics	2	
30.625	English Literature to 1800	2	
30.626	English Literature Since 1800	2	
30.627	American Literature to 1860	2	
30.628	American Literature Since 1860	2	
30.641, 30.642	Chaucer or		
30.643, 30.644	Shakespeare	4	
30.631, 30.632	Restoration and 18th Century Eng. Lit. or		
30.633, 30.634	Romantic Poets of the 19th Century	4	
30.637	English Drama or	2	
30.653	American Drama	2	
	The remaining six hours must be taken from the following courses:		
30.635, 30.636	The English Novel	4	
30.651	The American Short Story	2	
30.652	The American Novel	2	
30.654	Contemporary American Poetry	2	
30.655	Modern American Novel	2	

Minor Concentration Courses* — required**		**15**
Elective Courses		**17**
	Total hours required for degree	**130**

*,**,*** — For explanation see bottom of page 57.

HISTORY-GOVERNMENT   **Bachelor of Science Degree**

		semester hours
Core Courses — required		**68**

Economics:
| 20.601, 20.602 | Economic Principles and Problems | 4 |

English:
| 30.601, 30.602 | English | 4 |

| Fine Arts: | *Art or Music | 4 |

Government:
| 22.601, 22.602 | American Government | 4 |
| 22.603 | Comparative Government | 4 |

History:
23.601-604	History of Civilization	8
23.605	The United States to 1865	2
23.606	The United States Since 1865	2

Literature:
30.603	Introduction to Literature	2
30.627	American Literature to 1860	2
30.628	American Literature Since 1860	2
30.625	English Literature to 1800	2
30.626	English Literature Since 1800	2

**Modern Language:
| | Elementary | 4 |
| | Intermediate | 4 |

Philosophy:
| 24.601, 24.602 | Introduction to Philosophy | 4 |

Psychology:
| 25.601, 25.602 | General Psychology | 4 |

Science:
| 82.601 | Survey of Physical Sciences | 3 |
| 82.602 | Survey of Biological Sciences | 3 |

Sociology:
| 36.601, 36.602 | Principles of Sociology | 4 |

Major Concentration Courses — required		**30**
23.607	Recent American History	2
23.608	English Constitutional History	2
23.609	American Constitutional History	2
23.612, 23.613	English History	4
23.614	Modern European History or	
23.615	Recent European History	2
23.622	Contemporary Middle East or	
23.621	Contemporary Africa or	
23.620	Contemporary Latin America	2
23.623, 23.624	History of Russia to 1917 or	
23.616, 23.617	Russia Since 1917	4
23.618	Modern India or	
23.619	Modern China and Japan	2
22.613	Modern Political Theory	2
22.610	American Foreign Policy	2
22.606, 22.607	International Relations or	
22.611, 22.612	Soviet Foreign Policy	4
22.608	Current Political Issues or	
22.609	American Politics and Political Parties	2

Minor Concentration Courses* — required**		**15**
Elective Courses		**17**
	Total hours required for degree	**130**

*,**,*** — For explanation see bottom of page 57.

PSYCHOLOGY   **Bachelor of Science Degree**

			semester hours
Core Courses — required			**70**
Economics:			
20.601, 20.602	Economic Principles and Problems	4	
English:			
30.601, 30.602	English	4	
Fine Arts:	*Art or Music	4	
Government:			
22.601, 22.602	American Government	4	
History:			
23.601, 23.604	History of Civilization	8	
	*Courses Approved by the Dean	4	
Literature:			
30.603	Introduction to Literature	2	
	*Courses Approved by the Dean	8	
Mathematics:		4	
**Modern Language:			
	Elementary	4	
	Intermediate	4	
Philosophy:			
24.601, 24.602	Introduction to Philosophy	4	
Psychology:			
25.601, 25.602	General Psychology	4	
Science:			
57.601, 57.602	General Biology	8	
Sociology:			
36.601, 36.602	Principles of Sociology	4	
Major Concentration Courses — required			**30**
39.610, 39.611	Statistics	4	
25.633, 25.634	Experimental Psychology	6	
25.641	History of Psychology	2	
25.642	Systems and Theories of Psychology	2	
25.671	Seminar in Psychology	2	
	Major electives — A minimum of 14 hours must be taken from the following:		
25.605	Child Psychology	2	
25.606	Adolescent Psychology	2	
25.608	Social Psychology	2	
25.607	Psychology of Personality	2	
25.631, 25.632	Abnormal Psychology	4	
25.621	Motivation	2	
25.622	Psychological Testing	2	
25.623	Industrial Psychology	2	
Minor Concentration Courses* — required**			**15**
Elective Courses			**15**
	Total hours required for degree		**130**

*,**,*** — For explanation see bottom of page 57.
Recommended minors: Philosophy, Mathematics — Physics, Sociology.

SOCIOLOGY   **Bachelor of Science Degree**

		semester hours
Core Courses — required		**68**
Economics:		
20.601, 20.602	Economic Principles and Problems	4
English:		
30.601, 30.602	English	4
Fine Arts:	*Art or Music	4
Government:		
22.601, 22.602	American Government	4
History:		
23.601-604	History of Civilization	8
	*Courses approved by the Dean	4
Literature:		
30.603	Introduction to Literature	2
	*Courses approved by the Dean	8
**Modern Language:		
	Elementary	4
	Intermediate	4
Philosophy:		
24.601, 24.602	Introduction to Philosophy	4
24.607, 24.608	Principles and Problems of Social Ethics	4
Psychology:		
25.601, 25.602	General Psychology	4
Science:		
82.601	Survey of Physical Sciences	3
82.602	Survey of Biological Sciences	3
Sociology:		
36.601, 36.602	Principles of Sociology	4
Major Concentration Courses — required		**30**
36.603	Social Problems	2
36.604	Social Disorganization	2
36.608, 36.609	American Culture	4
36.610, 36.611	Juvenile Delinquency	4
36.612, 36.613	Criminology	4
36.614, 36.615	Social Service I and II	4
36.617	The Family	2
36.618	Race Relations and Cultural Contact or	
36.619	Urban Society	2
36.620	Social Control	2
36.622, 36.623	Social Theory	4
Minor Concentration Courses* — required**		**15**
Elective Courses		**17**
	Total hours required for degree	**130**

*,**,*** — For explanation see bottom of page 57.

**FORSYTH-NORTHEASTERN UNIVERSITY PROGRAM FOR
DENTAL HYGIENISTS**   **Bachelor of Science Degree**

			semester hours
Associate in Science Degree			72
(Day program at Northeastern University and Forsyth School for Dental Hygienists)			
Liberal Arts Courses			58
(Required through University College)			
Economics:			
20.601, 20.602	Principles and Problems of Economics	4	
Fine Arts:	*Art or Music	4	
Government:			
22.601, 22.602	American Government	4	
History:			
	*Courses Approved by the Dean	8	
Literature:			
30.603	Introduction to Literature	2	
	*Courses approved by the Dean	8	
Philosophy:			
24.601, 24.602	Introduction to Philosophy	4	
Elective Courses*			24
	Total hours required for degree		130

*, *** — For explanation see bottom of page 57.

COMBINED PROGRAM IN LIBERAL ARTS AND MANAGEMENT
Bachelor of Science Degree

			semester hours
Liberal Arts Courses:			**72**
		English	4
		Fine Arts	4
		Government	6
		History	8
		Literature	8
		Philosophy	4
		Psychology	8
		Science	6
		Sociology	6
		Elective Courses	18
Management Courses:			**58**
41.628,	41.629	Managerial Accounting	4
	45.601	Introduction to Management	2
20.601,	20.602	Economic Principles and Problems	4
	20.603	Money and Banking	2
	20.604	Financial Organization and Management	2
20.605,	20.606	Financial Policies and Planning	4
20.610,	20.611	Management Statistics	4
20.618,	20.619	Business Planning and Research	4
5.601,	5.602	Industrial Management	4
	42.610	Labor Management Relations	2
	46.601	Law I	2
	46.602	Law II	2
	46.603	Law III	2
43.601,	43.602	Principles of Marketing	4
	43.615	Purchasing I	2
14.601,	14.602	Mathematics	4
	45.610	Office Management Practices	2
		Electives	8
		Total hours required for degree	130

The Associate in Science Degree

The program leading to the associate degree is offered for those who are desirous of obtaining a general cultural background in the liberal arts and humanities, but who do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science Degree must complete a minimum of 72 semester hours of credit. This is approximately one-half of the requirements (130 semester hours) for the Bachelor of Science Degree.

To provide a balanced program which will achieve the established objectives, the faculty has set minimum credit requirements in the several areas of study as follows:

Distribution Requirements

	semester hours
Economics	4
English	4
Fine Arts	4
Government	6
History	8
Literature	10
Philosophy	4
Psychology	4
Science	6
Sociology	4
Other Elective Courses	18
Total	72

Law Enforcement and Security

The degree programs in Law Enforcement and Security have been established in University College for the purpose of improving the total effectiveness of the police officer and the security administrator in our society. The programs will also expand the body of knowledge of these two new fields of academic interest as well as the perspectives of those involved in them and will raise professional standards of police service and security administration through university-centered police and security education.

The New England Police Institute, an integral part of the Department of Law Enforcement and Security, also offers periodically a number of intensive specialized police and security seminars on a concentrated basis for adult practitioners actively engaged in the police and security fields.

All police courses are offered in co-operation with the New England Association of Chiefs of Police, the Massachusetts Chiefs of Police Association, the Massachusetts Police Association and the Massachusetts State Police. Every effort is made to maintain close liaison with the active police field so that all offerings are oriented practically as well as academically.

LAW ENFORCEMENT   **Bachelor of Science Degree**

			semester hours
Required Courses			**68**
20.601, 20.602	Economic Principles and Problems	4	
30.601, 30.602	English	4	
30.603	Introduction to Literature	2	
30.604	Business Writing	2	
30.605	Business Reports	2	
	Literature	4	
22.601, 22.602	American Government	4	
22.621	State and Local Government	2	
22.623	Public Administration	2	
22.622	American Constitutional Law	2	
23.605	The United States to 1865	2	
23.606	The United States since 1865	2	
23.608	English Constitutional History	2	
25.601, 25.602	General Psychology	4	
25.607	Psychology of Personality	2	
26.631, 25.632	Abnormal Psychology	4	
82.601	Survey of Physical Sciences	3	
82.602	Survey of Biological Sciences	3	
14.601, 14.602	Mathematics	4	
36.601, 36.602	Principles of Sociology	4	
36.610, 36.611	Juvenile Delinquency	4	
36.612, 36.613	Criminology	4	
36.618	Race Relations and Culture Contact	2	
Required Professional Courses			**44**
86.601	Administration of Justice	2	
86.602	Law Enforcement Administration and Management	2	
86.603, 86.604	Police Interrogation	4	
86.605, 86.606	Criminal Investigation and Case Preparation	4	
86.607, 86.608	Police Patrol	4	
86.609	Criminal Law	2	
86.610	Evidence	2	
86.611, 86.612	Traffic Law Enforcement	4	
86.613	Records in Law Enforcement	2	
86.614	Criminal Identification	2	
86.615	Introduction to Criminalistics	2	
86.616	Police Juvenile Methods	2	
86.617	Special Problems in Law Enforcement Administration and Management	2	
86.618	Investigative Report Writing	2	
86.619	Police Supervision	2	
86.620, 86.621	Police Public and Community Relations	4	
86.622	Police Research Methods	2	
Elective Courses			**18**
	Total hours required for degree		**130**

SECURITY   **Bachelor of Science Degree**

			hours	
Required Courses				**70**
41.628,	41.629	Managerial Accounting	4	
20.601,	20.602	Economic Principles and Problems	4	
30.601,	30.602	English	4	
	30.603	Introduction to Literature	2	
	30.604	Business Writing	2	
	30.605	Business Reports	2	
		Literature	4	
22.601,	22.602	American Government	4	
	22.622	American Constitutional Law	2	
23.616,	23.617	Russia since 1917	4	
	23.605	The United States to 1865	2	
	23.606	The United States since 1865	2	
	5.611	Industrial Safety	2	
44.601,	44.602	Insurance Principles	4	
44.604,	44.605	Casualty Insurance	4	
25.601,	25.602	General Psychology	4	
	25.607	Psychology of Personality	2	
	82.601	Survey of Physical Sciences	3	
	82.602	Survey of Biological Sciences	3	
14.601,	14.602	Mathematics	4	
36.601,	36.602	Principles of Sociology	4	
36.612,	36.613	Criminology	4	
Required Professional Courses				**38**
	86.601	Administration of Justice	2	
	86.602	Law Enforcement Administration and		
		Management	2	
86.603,	86.604	Police Interrogation	4	
86.605,	86.606	Criminal Investigation and Case Preparation	4	
86.607,	86.608	Police Patrol	4	
	86.609	Criminal Law	2	
	86.610	Evidence	2	
86.611,	86.612	Traffic Law Enforcement	4	
	86.618	Investigative Report Writing	2	
	86.621	Police Research Methods	2	
86.623,	86.624	Government Security Programs	4	
86.625,	86.626	Plant Protection	4	
	86.627	Industrial Fire Prevention	2	
Elective Courses				**22**
		Total hours required for degree		**130**

LAW ENFORCEMENT   **Associate in Science Degree**

			semester hours
Required Courses			**32**
30.601,	30.602	English	4
22.601,	22.602	American Government	4
	22.621	State and Local Government	2
	22.622	American Constitutional Law	2
	23.605	The United States to 1865	2
	23.606	The United States since 1865	2
25.601,	25.602	General Psychology	4
36.601,	36.602	Principles of Sociology	4
36.610,	36.611	Juvenile Delinquency	4
36.612,	36.613	Criminology	4
Required Professional Courses			**34**
	86.601	Administration of Justice	2
86.603,	86.604	Police Interrogation	4
86.605,	86.606	Criminal Investigation and Case Preparation	4
86.607,	86.608	Police Patrol	4
	86.609	Criminal Law	2
	86.610	Evidence	2
86.611,	86.612	Traffic Law Enforcement	4
	86.614	Criminal Identification	2
	86.615	Introduction to Criminalistics	2
	86.616	Police Juvenile Methods	2
	86.618	Investigative Report Writing	2
86.620,	86.621	Police Public and Community Relations	4
Elective Courses			**6**
		Total hours required for degree	**72**

SECURITY   **Associate in Science Degree**

			semester hours
Required Courses			**34**
30.601, 30.602	English	4	
30.604	Business Writing	4	
30.605	Business Reports	4	
22.601, 22.602	American Government	4	
23.616, 23.617	Russia since 1917	4	
23.605	The United States to 1865	2	
23.606	The United States since 1865	2	
5.611	Industrial Safety	2	
25.601, 25.602	General Psychology	4	
36.601, 36.602	Principles of Sociology	4	
36.612, 36.613	Criminology	4	
Required Professional Courses			**26**
86.601	Administration of Justice	2	
86.603, 86.604	Police Interrogation	4	
86.605, 86.606	Criminal Investigation and Case Preparation	4	
86.609	Criminal Law	2	
86.610	Evidence	2	
86.618	Investigative Report Writing	2	
86.623, 86.624	Government Security Programs	4	
86.625, 86.626	Plant Protection	4	
86.627	Industrial Fire Prevention	2	
Elective Courses			**12**
	Total hours required for degree		**72**

Description of Courses

The University reserves the right to withdraw, modify, or add to the courses offered or to change the order of courses in curricula as may seem advisable. Not all courses are offered every year.

The University further reserves the right to withdraw in any year any elective or special course for which less than twelve enrollments have been received. Regular students so affected by such withdrawal will be permitted to choose some other course. In the case of special students, a full refund of all tuition and other fees will be made.

The University also reserves the right to change the requirements for graduation, tuition and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Credit for a full-year course is contingent upon satisfactory completion of both semesters.

Credit for one-half of a full-year course is given only by approval of the Dean.

5—Industrial Management

5.601, 5.602   Industrial Management   4 hrs.
Principles and techniques in the successful administration of manufacturing management; study of management and organization; policy determination; plant location; labor requirements; materials handling; routing of operations; personnel selection and training; job evaluation; wage and salary structures; motion and time study; quality, inventory, production and cost control systems.

5.603   Production Control   Prep. 5.602; 2 hrs.
The place of production control in the development and operation of a manufacturing unit, interrelationship of functions, application to differing types of industry, organization of the Production Control Department, quantitative analysis, the significance of costs in production control, relationship to sales and manufacturing forecasts, intermittent versus continuous manufacturing, inventory control, production control in a small company, the use of charts and control boards, automation in continuous and intermittent manufacturing, and the use of computers.

5.604   Production Processes   Prep. 5.602; 2 hrs.
Processes and shop production methods employed in the manufacture of products using various types of materials; castings; hot-working, cold-forming, and joining of metals; machine shop production methods; plastics and plastic molding; common production tools such as shears, presses, press brakes, lathes, boring mills, screw machines, milling machines, drills, shapers, slotters, planers, broaching machines, grinders, and saws.

5.605, 5.606   Work Simplification   4 hrs.
Process analysis thru the use of process charts and flow diagrams; work sampling; multiple activity charts; work simplification as an aid to plant layout; operations analysis using principles of motion economy; micromotion study by camera analysis. Laboratory practice.

5.607   Work Measurement   2 hrs.
Basic concepts of time study with special emphasis on building time standards on manual and machine operations; techniques involved in performance rating and the development of standard data for synthetic rate setting; an introduction to predetermined time value systems. Laboratory practice.

5.608   Time Study   Prep. 5.607; 2 hrs.
Review of stop-watch time study and performance ratings; introduction to the use of element time studies for developing standard data; incentives for indirect labor; procedure for handling involved time studies; development of tables, families of curves, formulae, nomographs, and multi-variable charts for synthetic rate-setting purposes.

5.609   Job Analysis and Evaluation   2 hrs.
Fundamental concepts of wage payment systems; theory of wage determinations, job elements, rating scales, writing job descriptions and specifications; selection of appropriate rating plans; setting up job factors and maximum point values; use of several methods of determining specific point values; development of wage structures; laboratory projects.

5.610   Materials of Production   Prep. 5.602; 2 hrs.
Basic characteristics of ferrous and nonferrous metals, special alloys, plastics, etc., e.g., structure, hardness, strength in compression, tension, shear, working ability; thermal, physical, electrical and chemical properties. Inspection for various types and kinds of machine tools.

5.611   Industrial Safety — Industrial Accident Control   2 hrs.
Organization and administration of a comprehensive accident prevention program; analysis of basic industrial hazards; factors involved in industrial accidents with corrective action; responsibilites and functon of top management, the safety engineer, the supervisor and the safety committee; training programs; accident investigation; promoting management participation.

5.614, 5.615   Material Handling Fundamentals   Prep. 5.602, 14.602; 4 hrs.
Introduction to material handling as an integrated essential of production planning and manufacturing operations; efficiency of operation, reduction in manufacturing costs and management control; materials handling planning for a typical industrial plant, including selection of equipment, stores planning, development of operating procedures and materials handling during the production process.

5.616   Advanced Material Handling   Prep. 5.615; 2 hrs.
Major engineering principles which form the basis of material handling equipment design and its application; characteristics, advantages, disadvantages, and practical application of all types of gravity and powered unit-handling systems, conveyors, including skate wheel, roller, live roller, belt, slat, and overhead trolley; reciprocating and continuous type lifts; dragline systems; crane systems; and automated warehousing applications.

5.617, 5.618   Quality Control Statistics   Prep. 14.602; 4 hrs.
Elements of statistical quality control and its use to attain reduction in scrap and rework, lower costs, and reduce complaints; solution of production and engineering problems with the aid of statistical tools to prevent the manufacture of defects.

The determination of machine and process capability, use of histograms to identify abnormal variability, the use of quality control charts for measurable and non-measurable quality characteristics, rational determination of tolerances, scientific sampling methods for process control, acceptance sampling of material by lots and the use of Military Standard 105B, current government quality control requirements, and psychological factors in controlling quality. Note: 39.610, 39.611 Management Statistics, and 5.617, 5.618 Quality Control Statistics, may not **both** be taken for credit.

5.619   Advanced Quality Control   Prep. 5.618 or 39.611; 2 hrs.
Special purpose control charts; multi-vari charts; pictograms; PD-diagrams; the Lot Plot inspection method; narrow-limit gauging; variables sampling plans; the Span Plan for process capability analysis; principles of visual inspection; establishing quality assurance; check inspection methods; special troubleshooting techniques.

5.620   Management of Quality Control   Prep. 5.618; 2 hrs.
Non-technical aspects of administering a quality control program; economics of quality; relation of design and inspection to control of quality; organizing for quality control, quality control engineering; integration of quality functions; methods of obtaining quality assurance; and case studies.

5.621   Reliability Engineering   Prep. 5.618; 2 hrs.
The collection and analysis of data relating to design, production, and
field performance of the product in terms of reliability factors, reliability
concepts, definitions and military specifications; contract negotiations in-
volving reliability program planning, funding organization and supervision
along with reliability activities prior to and after design release; vendor
and subcontractor reliability requirements, system evaluations and reliability
data; a study of basic reliability statistics and quality control with a projec-
tion of future trends for this area.

5.622   Mathematical Concepts of Reliability Engineering   Prep. 5.621; 2 hrs.
Statistical tools for use in system evaluation, reliability prediction, demon-
stration testing, and data analysis. Reliability probability distributions,
measures of probability, and methods of tolerance.

5.623, 5.624   Plant Layout   Prep. 5.604; 5.606 4 hrs.
Physical arrangement of machines and equipment, layout of utilities such
as power, light, water, sprinklers, drainage, telephones, heating equipment,
lavatories; cost fatcors including estimates of construction changes are
evaluated to determine most economical layout; layout of office areas and
departments servicing production as well as areas designed for employee
safety and convenience; design is checked for conformance to local and state
regulations pertaining to building codes, zoning, safety, and fire protection.
Finished layout drawings are prepared for presentation to management.

5.625   Gauging and Measurement for Inspection   2 hrs.
An operating and technical-level course involving mensuration, need and
function of inspection and specifications; basic principles and techniques
of measurement; various methods and equipment used for gauging and
measuring; special measuring and inspection problems; quality control and
process inspections.

5.641   Industrial Experimentation I   Prep. 5.619 or 20.612; 4 hrs.
Modern small-sample techniques are applied to industrial problems. Use of
statistical inference to make estimates and set confidence intervals of
key characteristics of production lots and processes; design of single- and
multiple-factor experiments; tests of significance; analysis of variance; use of
the normal, binomial, Poisson and Chi-Square distributions, as well as non-
parametric methods; shortcuts and "rough-but-quick" tests. Emphasis is on
avoiding experimental blind alleys, with the associated vital savings in
dollars and days. Note: 29.614 Statistics for Business Decisions and 5.625,
5.626 Industrial Experimentation may not **both** be taken for credit.

5.642   Industrial Experimentation II   Prep. 5.641; 2 hrs.
Tests of significance, analysis of variance, correlation techniques, and ex-
perimental design.

5.643   Synthetic Time Standards — M.T.M.   Prep. 5.626; 2 hrs.
Use of tools and procedures necessary for the development of production, and mechanical standards for manufacturing, maintenance and office operations, using the predetermined time value system; methods-time measurement; laboratory practice.

5.644   Materials Management Seminar   Prep. 5.602; 2 hrs.
At the management level this seminar features an intensive study of customer service, ordering, scheduling, dispatching, purchasing, receiving, shipping, stockkeeping and warehousing by using the case study and conference approach. The class operates as a team setting up a materials control function, staffs it, writes up job descriptions, prepares flow charts and special forms and establishes company policies.

5.645   Manufacturing Seminar   Prep. 5.602, 5.604; 2 hrs.
Problems of manufacturing operations at the plant manager level; economics of production when considering aspects of specialization, simplification, standardization, and diversification, expansion, contraction, or integration; materials, plant location and layout, power, maintenance, labor supply, organization, wage policy, etc., and concerns itself with considering the controls of the manufacturing processes, i.e., product development, scheduling, inventory, quality, cost, and budgetary controls.

14 — Mathematics

Fundamentals of Mathematics   Non-credit
A review of arithmetic and elementary algebra to prepare for Mathematics 14.601 and 14.602. Operations with integers, fractions, decimals, signed numbers, and algebraic expressions.

14.601, 14.602   Mathematics   4 hrs.
An intensive review of algebra and trigonometry; exponents and logarithms; graphic presentation and analysis of data; interest, time payments, and investment; introductory statistics and probability.

14.603, 14.604   Mathematics for Scientific Business Management   Prep.
14.602; 4 hrs.
Concepts of mathematics necessary for further serious work in statistics and operations research, with emphasis on applications to business management. Logic, probability theory, linear algebra (vectors and matrices), stochastic processes, decisions under uncertainty, linear programming.

20 — Economics & Finance

20.601, 20.602   Economic Principles and Problems   4 hrs.
Significant economic principles about industry, labor, money, banking, distribution of income to the factors of production, business fluctuations, and forms of social organization. Emphasis is placed on basic principles and laws and consideration is given to current economic problems.

20.603   Money and Banking   Prep. 20.602; 2 hrs.
Money, the commercial banking structure, the Federal Reserve System, and other financial agencies and institutions as they relate to the operations of the business firm and the general economy form the basis of the first semester.

20.604   Financial Organization and Management   Prep. 20.603,
                                                           41.604 or 41.629; 2 hrs.
Various forms of financial organizations and management, the financial
and legal implications of the form of organization and the various tools
used in internal financial analysis including budgets, and flow of funds
statements.

20.605, 20.606   Financial Policies and Planning   Prep. 20.604; 4 hrs.
Short and intermediate term financing, trade credit, bank credit, factoring,
equipment loans, long term financing and the valuation of business enter-
prises, forms and sources of long term debt, lease arrangements, man-
agement of common and preferred stock, dividend policy, principles of
valuation and problems of merger, reorganization, and liquidation.

20.607   Investment Principles   Prep. 20.606; 2 hrs.
Characteristics of the entire range of securities from government bonds to
common stocks. Sources of information, mathematics and mechanics of
investment and the differing analytical approach to various industries are
considered primarily from the viewpoint of the individual private investor.

20.608   Economic Geography   2 hrs.
Physical geography; resource distribution and development; climatology.
The relationship of these factors to world trade and political-economic
aspects of resource distribution and development.

20.609   Government Controls in Business   Prep. 20.602; 2 hrs.
The economic and political relationships which exist between business and
government with particular reference to the Sherman Act and Anti-Trust
Laws; Securities and Exchange Commission; Interstate Commerce Commis-
sion; regulation of public utilities: the Co-operative Movement; the Social
Security Act; government and labor; business regulation by taxation.

20.610, 20.611   Management Statistics   Prep. 14.602; 4 hrs.
Statistical techniques and their application; descriptive measures of shape,
location, and dispersion; an introduction to probability; sampling and
simple analysis of observed distributions; advanced concepts in probability;
sampling and statistical inference; time series analysis; correlation and
index numbers. Note: 39.610, 39.611 Management Statistics, and 5.617,
5.618 Quality Control Statistics may not **both** be taken for credit.

20.612   Statistical Methods in Forecasting   Prep. 20.611; 3 hrs.
Introduction to the application of time series and analysis. Among the
principal topics considered are the measurements of secular trends by
free hand and mathematical methods; the measurement of seasonal fluctu-
ations; cyclical fluctuations; the general nature and calculation of index
numbers; and a discussion of regression and correlation.

20.614   Statistics for Business Decisions   Prep. 20.611 or 5.618; 2 hrs.
A business-oriented study of statistical decision making; formulation and
testing of hypotheses concerning averages, proportions and deviations of
single samples and differences between statistics and pairs of samples.
Note: 39.614 Statistics for Business Decisions and 5.625, 5.626 Industrial
Experimentation may not **both** be taken for credit.

20.615   Foreign Trade   Prep. 20.602; 4 hrs.
World trade, its development and current status, balance of international payments, trade agreements, tariff and non-tariff control measures and policies, export and import departments, middlemen, foreign agents and distributors, branch houses, import and export traffic, study and choice of markets, settlement of trade disputes, international banking facilities, foreign credits, foreign exchange and foreign investments.

20.616   International Economics   Prep. 20.602; 2 hrs.
Analysis of foreign trade and finance in terms of current practices and theories; relationship between national welfare and foreign trade; problems of the balance of trade; problems of international monetary control; international investments.

20.617   Monetary Policy   Prep. 20.606; 2 hrs.
Nature of money and credit and their influence on interest rates, prices and the level of our economy; monetary theory.

20.620   Government Finance   Prep. 20.603; 2 hrs.
Governmental expenditure, revenue and debt, and their economic effects and relationships to principles of economic welfare; federal budget systems, principles of taxation, and fiscal policy.

20.621   Credit Fundamentals   Prep. 41.604 or 41.629; 2 hrs.
Organization and functions of the commercial credit department; classification of credit and types of agencies involved; factors involved in a credit risk; investigation of credit factors; credit services.

20.622   Credit Problems   Prep. 20.621; 2 hrs.
Problems of the credit manager in determining credit disposition; ratio analysis of financial statements, statement analysis by comparison, collection problems and procedures, insolvency in its various forms, creditors' legal aids, credit insurance and guaranties, activities of the National Association of Credit Men.

20.623   Consumer Credit   Prep. 20.621; 2 hrs.
All phases of credit extended to consumers — retail stores; bank personal loans; consumer financing by banks; real estate financing; bank charge account plans; small loan companies; sales finance companies; utility companies; credit investigation and evaluation; collection procedures; Credit Bureau operations; legal aspects of credit.

20.624   Personal Finance   2 hrs.
A discussion of money, its function, dollar value; expense control through budgeting; wise buying methods and policies — charge accounts, installment buying; financial institutions for borrowing money; protection against risk to person and property; methods of saving; the place of life insurance in financial planning; owning a home; investing in securities; trust funds, investment trusts; making a will; business fluctuations and the planning of personal finances.

20.641, 20.642 Business Planning and Research   Prep.
                                                      20.606, 20.611; 4 hrs.

Sources of information, strengths and weaknesses of principal measures of business activity; use of widely accepted indices in general business forecasting; sales forecasting, business cycle analysis and the effects of the broadening relation of government policies upon the individual business firm.

22 — Government

22.601, 22.602 American Government   4 hrs.

The study of our National Government with respect to its organization and function; its powers and limitations under the Constitution; its legislative, administrative, and judicial machinery under the party system of government and bureaucracy. Detailed study of the relationships of our federal, state, and municipal governments, including an analysis and comparison of the various state governments and types of municipal government with respect to state and local agencies for carrying out the executive, legislative, and judicial functions of government in a democratic country.

22.603 Comparative Government   Prep. 22.602; 2 hrs.

Examines the political structure of major contemporary democratic states, the nature and mechanics of political democracy in England and the Commonwealth Nations, France, and other continental democracies. Surveys the constitutional development, parties, and elections, legislative and executive responsibility, cabinet governments, public administration, legal system, local government, and current political problems and policies in the above named states.

22.604 Comparative Government   Prep. 22.603; 2 hrs.

Examines the political structure of existing totalitarian states with special emphasis on the several aspects of Marxist concepts of government as exemplified in Russia, China, and with reference to Fascist concepts of government practiced prior to World War II in Germany and Italy. Reference is made frequently to older forms of autocratic government.

22.605 Plato's Republic   Prep. 22.602; 2 hrs.

An examination of a fundamental book on politics. The study will seek to make clear the underlying rationale of Plato's political thought. Its possible application to present-day social understanding will be explored.

22.606, 22.607 International Relations and Politics   Prep. 22.602; 4 hrs.

A study of politics among nations. Nature of the nation state. Instruments of state policy. Objectives of state policy. Rise of diplomacy. Peace through alliance. Collective security. Existing international limits on state policy. Recent policies of major powers.

22.608 Current Political Issues   2 hrs.

Deals with the major political issues before the American people today with the suggestions made by various groups to meet these issues. An attempt will be made to present all points of view and to show the student how to

recognize them in local and national newspapers and magazines. Part of each week will be spent in an analysis of current issues as seen in Republican and Democratic news organs from several different viewpoints, and assignments will be made from these publications as well as from textbooks. Controversy and debate will be encouraged.

22.609   American Politics and Political Parties   Prep. 22.602; 2 hrs.
Deals with democracy at work under the American system of political parties. It is introduced by a consideration of the various groups such as sectional, business, labor, farmer, racial, religious, veteran, etc., which contend for power through our democratic processes; the techniques used by these pressure groups such as lobbies, propaganda, education, financial pressure, etc. The two-party system, with the history, platform, and policy of each, is analyzed and discussed. The reasons and relative successes of Third Party attempts from the early Populists to the Progressives are considered with the national minority parties and the state party groupings. Concludes with state and local politics and the electorate in an attempt to determine why people vote as they do.

22.610   American Foreign Policy   Prep. 22.602; 2 hrs.
Concentrates on the role of the United States in world politics, principally since the end of World War II. The history of American foreign policy since 1775 serves as a background for understanding present policy. An analysis of the governmental mechanism for the conduct of United States foreign affairs, fundamental factors affecting American foreign policy and the major problems confronting the United States receive stress.

22.611, 22.612   Soviet Foreign Policy   4 hrs.
Deals primarily with Soviet foreign policy and World Communism. It will deal exhaustively with the so-called "seven periods" of Soviet Foreign policy; the Comintern period, the period of retrenchment and resurgence in the twenties, the growth of Fascism and the resulting Popular Front, the Nazi-Soviet Alliance, the War Front of 1941-1945, and the postwar period. Much attention will be paid to the workings of Communist parties in Europe and Asia, as well as in the United States; to the phenomenon of Titoism; and finally to a discussion of the cold war, Korea, China, and possible alternatives of American foreign policy today.

22.613   Modern Political Theory   Prep. 22.604; 2 hrs.
A critical study of the major systems of political philosophy since Bentham. An ever-present consideration will be the impact of these systems of thought on present-day social science.

22.615   Government and Politics of Underdeveloped Nations   Prep. 22.602; 2 hrs.
The political structure and dynamics of certain key nations that are attempting to maintain political independence and stability in the face of economic want. Nations for study will be selected from the Near East, Africa, South America, and Southeast Asia.

22.616   Modern Ideologies   Prep. 22.602; 2 hrs.
The major ideologies existing in today's world; communism, fascism, capitalism and socialism. Writings by defenders of each ideology will be read. A paper will be required from the student.

22.617   Politics and Administration   Prep. 22.602; 2 hrs.
Decision-making in administration; executive control over administration; congressional interest in administration; the impact of parties and pressure groups on administration; administration and public relations; technical competence and the administrative generalist.

22.618   Mass Media and Democratic Politics   Prep. 22.602; 2 hrs.
The mass media identified. Mass media and representative democracy. Underlying beliefs and unpopular opinions. The problem of bias and of varied points of view. The problem of significant coverage of events. The meaning of press freedom for the mass media. The mass media and internal censorship. Implications for citizen education. The possibility of a more responsible mass communications media.

22.620   City Life and Politics   Prep. 22.602; 2 hrs.
The impact of urbanization on political personality. The political implications of transiency, of depersonalization and the breakdown of friendship groups, of mass communications as an educator of citizens. The nature of citizenship in our metropolitan centers. The meaning of bossism and recent developments in metropolitan political leadership. Metropolitan reconstruction for personal happiness.

22.621   State and Local Government   2 hrs.
Legal bases of state and local government as determined by constitutions. Structure of state and local government; various services of state and local government.

22.622   American Constitutional Law   2 hrs.
Case study of American Federalism; judicial review; the commerce, fiscal, military, and other powers of Congress and the powers of the President in domestic and foreign affairs.

22.623   Public Administration   2 hrs.
Existing administrative structure and efforts at reorganization. Principles which should determine administrative organization and practice, and problems of finance administration.

23 — History

23.601, 23.602   History of Civilization   4 hrs.
Introductory lectures deal with the beginnings of civilization and the contributions of Egypt, Babylonia, and Syria. More detailed work is done in Greek and Roman history, the rise of Christianity, the barbarian invasions of the Roman Empire, and the origins and growth of Islam.

23.603, 23.604   History of Civilization   4 hrs.
Deals with the history of the Middle Ages, the growth of the monarchies
in Europe, the development of constitutional government, the Renaissance,
the doctrines and politics of the Protestant Reformation, the economic and
the industrial revolution, the growth of science and industrialism, and the
origins of the World War.

23.605   The United States to 1865   2 hrs.
An interpretation of the events which shaped the American nation to the
Civil War. The course stresses political history and makes use of social,
intellectual, and economic influences in interpreting political events.

23.606   The United States Since 1865   2 hrs.
The problems of Reconstruction, third party protests, the money question,
Progressivism and New Dealism, as well as the emergence of the United
States as the dominant world power after two world wars.

23.607   Recent American History   2 hrs.
The contending political, economic and social forces in American domestic
history of the Twentieth Century and America's rise to world leadership.
This takes the student from McKinley laissez-faire through the Fair Deal
to the Kennedy administration, and from the emergence of the United
States as a world power in the early part of the century to its present
position of dominance.

23.608   English Constitutional History   2 hrs.
The origin and development of the English Constitution up to 1485. Special
emphasis is placed on those institutions and concepts that form the
background for American constitutional history. The important differences
between the American and English constitutions are stressed. This course
is important for those who intend to study law.

23.609   American Constitutional History   2 hrs.
The history and principles of American constitutional law. Designed to give
the student an understanding of case-law and the significance of the courts
in the American system of government. Among the special topics covered
are the power of the Supreme Court to pass upon statutes, the relation
of national and state powers, civil rights, and the Commerce clause. Highly
recommended for students planning to study law.

23.610   Social and Cultural History of the U. S.   2 hrs.
The development of a distinct American civilization beginning about two
generations after the Revolutionary War. The institutions, social customs,
and culture of the Colonies as influenced by England. The influence of
the Southern aristocracy on the early cultural patterns, and the emergence
in the late Nineteenth Century of the impact of the industrial North;
Twentieth-Century Liberalism as an outgrowth of the Populist Movement,
Rooseveltianism, Progressivism, and the New Deal, and the growth of
welfare projects; a study of the influence of the Social Security Act and
contemporary American society.

23.611   Economic History of the U. S. 2 hrs.

The desire for freedom of manufacture as one cause of the Revolutionary War. The effect of the Embargo Act on trade in the early Nineteenth Century, the effect of agricultural feudalism in the South, the national growth of industry in the latter part of the Nineteenth Century. United States' preeminence in world trade and banking in the Twentieth Century, United States' position today and current economic trends.

23.612, 23.613   English History 4 hrs.

The development of three trends of importance in ancient and medieval England, namely, relationships between church and state, development of nationalism from feudalism, and the origin and development of the English constitution. The rise of cabinet parliamentary government, the Newtonian and Darwinian intellectual revolutions, the agricultural and industrial revolutions which set the stage for England's "Age of Reform"; the emergence of England as a socialist democracy.

23.614   Modern European History 1815-1913 2 hrs.

Europe during a century of comparative peace but tremendous social change. After examination of the period of reaction following the Congress of Vienna, attention shifts to those forces transforming European society — especially the Industrial Revolution and Nationalism. Places special emphasis upon such intellectual movements as Liberalism and Socialism and concerns itself with the various social, economic, and political factors which led to World War I.

23.615   Recent European History 2 hrs.

The contemporary era of conflict since 1914 is treated in this course. A discussion of Darwinian concepts which influence the Twentieth Century is followed by a detailed study of the varied applications of these ideas in the major European states. The course deals briefly with military aspects of both world wars and with postwar attempts to secure lasting peace. The Soviet Russian regime and basic Communist beliefs are examined in detail to provide an understanding of contemporary world developments.

23.616, 23.617   Russia Since 1917 4 hrs.

Concentrates on the rise of Marxist and Communist ideas in Europe, the nature of Marxist theory, the development of the Bolshevik Party and Leninism in Russia, the Russian Revolution, the Civil War, the New Economic Policy, and the development of social, economic, and political institutions in the Soviet Union to the present day.

23.618   Modern India 2 hrs.

Concerns Twentieth-Century India, its problems and basic civilization. The social and religious aspects of Hinduism, Muslim communalism, economic and population problems, and aspects of British imperialism form the background for the study of Gandhi's non-violent war of independence. India's present position as a factor in the world-wide balance of power is examined.

23.619   Modern China and Japan   2 hrs.

Twentieth-Century China and Japan, their problems, and basic civilizations. Basic Chinese philosophy, the rise and influence of Confucianism, Buddhism and its influence, Chinese and Japanese social and economic development precede a detailed study of the Chinese struggle against foreign imperialism which is depicted against the backdrop of the Japanese-American quarrel over the Open Door. The Communist victory in China is examined and the current United States position in the Far East is also considered.

23.620   Contemporary Latin America   2 hrs.

During the period since World War I there has developed an increasing interdependency between the nations comprising North and South America. Much attention has been given to the strengthening of the bond of inter-American friendship which has resulted in increased commerce and a closer unity of action in world politics.

Social, political, and economic developments of the countries of Latin America, their national character, and relation to world affairs, all studied through their cultural heritage and their emerging political patterns.

23.621   Contemporary Africa   2 hrs.

Africa is in a threshold period of its history. It is emerging from centuries of colonial subjugation into a position of positiveness in world affairs. This course will provide a basis for assessing the role Africa will play and the importance of that continent to the United States. It will concentrate on the principal characteristics and problems of modern Africa, including a survey of basic geographic, political, economic, and cultural features. Such problems as Nationalism, intergroup tensions, economic development, and urbanization will be discussed.

23.622   Contemporary Middle East   2 hrs.

In recent years the Middle East has been the center of an internal turmoil which has come to play an increasingly significant role in the conflict between East and West. The geographic and historic backgrounds, the Zionist and Arab Nationalist Movements, and the foreign policies of Britain and France in the area form the backdrop for a study of the social, political, and economic problems of the following nations: Turkey, United Arab Republic, Israel, Lebanon, Jordan, Iraq, Iran, Yemen, Saudi Arabia, Aden, Afghanistan and Pakistan.

23.623, 23.624   History of Russia to 1917   4 hrs.

The period from the Ninth Century to the November Revolution of 1917. Particular emphasis is placed on social, political, and economic aspects. The strengths of the Tsarist system are revealed, together with the evils and weaknesses primarily responsible for the rise of the Communist State. The **first semester** covers the development of the Russian State from the Pre-Kievan period through the reign of Catherine the Great. The **second semester** continues from the reign of Catherine emphasizing problems and developments leading up to the Bolshevik Revolution.

24 — Philosophy

24.601, 24.602   Introduction to Philosophy   4 hrs.
The aims, nature, problems of philosophy and its methods of inquiry and
explanation; examines and compares the relationships between common
sense, the concepts of the human and natural sciences, the philosophical
thought; theories about life, mind, and the physical world; teleology, vital-
ism, and mechanism; determination, freedom, fatalism, and chance; and the
sources standards and validity of knowledge. A critical analysis of the fun-
damental assumptions, teachings, and theoretical and practical implications
of the major schools of philosophy. Concludes with the function and bene-
fits of philosophical thinking for the examined life.

24.603   History of Ancient Philosophy   2 hrs.
Development of Western scientific and philosophical thought and its influ-
ences from classical Greek beginnings to medieval times, with special em-
phasis on such great trends, schools, and thinkers as the Sophists, the
Eleatics, Atomists, Plato, Aristotle, the Epicureans, the Stoics, the later
Skeptics, Neo-Platonists, and early Christian philosophers.

24.604   History of Modern Philosophy   2 hrs.
A study of the great philosophical minds and their intellectual climates
since the Renaissance. Comparison of ancient, medieval, and modern scien-
tific and philosophical objectives, methods, and outlooks on man, culture,
and nature. Particular attention to the writings of Bacon, Descartes, Hobbes,
Spinoza, Locke, Berkeley, Hume, Kant, Hegel, and others, as well as to their
influence on the contemporary Western milieu and treatment of recurrent
philosophical problems confronting man through the ages.

24.605   Philosophy of Art   2 hrs.
The nature, status, and function of art and beauty in their various forms in
life. The relationship between the artistic-aesthetic and other human values
and activities. Contrast between the practical, intellectual, and aesthetic
impulse and attitude. Classical theories concerning art and the aesthetic ex-
perience. The problem of taste, standards of criticism, and objectivity of ihe
aesthetic judgment. The arts, the artist, and society.

24.606   Philosophy of Religion   2 hrs.
A philosophical evaluation of religious experience, problems, beliefs, values
and of their relationship to man's experience in its totality and to his
needs, aspirations, and destiny. Discussion of modern conceptions about
the Deity, good and evil, meaning and purpose in life and the physical
world, human personality and freedom, immortality of the soul, and prayer
and worship. The bearing of views and problems in modern science, philos-
ophy of nature, theory of knowledge, ethics, aesthetics and general theory of
value on relevant phases of religious experience and belief.

24.607   Principles of Social Ethics   Prep. 24.602; 2 hrs.
Stresses concretely and analytically, such moral problems as human motives
and conduct, egoism and altruism, implications of modern psychological
and sociological theories about man and society, the meaning of good and

evil, right and wrong, the role of customs and tradition, conscience, obligation, law, responsibility, freedom, and determination. Evaluates the teachings of the major ethical schools, and explains the nature of the moral judgment and the ethical standard.

24.608 Problems in Social Ethics Prep. 24.607; 2 hrs.
An analytical, critical review of ethical data and the theories in an attempt to analyze concrete moral situations involving the individual, the family, business and industry, the professions, government and politics, labor unions, education, etc. Essential principles of reflective moral thinking and their applications to one's own personal life.

24.609 Logic I Prep. 24.602; 2 hrs.
The art of correct thinking and effective discourse, enabling the student to analyze types of argument or discourse and to detect fallacies resulting from semantic confusion and methodological error. Exercises in the structure and logical relations of propositions, types of deductive reasoning and other thought processes used to obtain clear verbalization.

24.610 Logic II Prep. 24.609; 2 hrs.
Limitations of deductive reasoning; nature of truth, proof, and their relationship to validity, inductive versus deductive procedures; the rationale of beliefs, common sense, and common practices; the scientific spirit and attitude; inductive procedures and proof, argument or verification in the physical and social sciences; judgments of fact and judgments of value; the testing of evaluative judgments; the functions and relationships of deduction and induction, formal and factual reasoning.

24.611, 24.612 Social and Political Philosophy Prep. 24.602
or 36.602; 4 hrs.
An evaluation of the major psychological, social, political, and ethical theories on the nature of man, society, institutions, values, with the main emphasis on thinkers and movements in the modern era, beginning with the seventeenth century. Readings chosen from the works of Hobbes, Locke, Hume, Rousseau, Hegel, J. S. Mill, T. H. Green, Bosanquet, Marx, Lenin, Spengler, Schweitzer, Toynbee, Whitehead, Northrop, and others.

24.613, 24.614 Contemporary Philosophical Tendencies Prep.
24.602; 4 hrs.
Selected problems and readings in 20th century philosophers representative of idealism, realism, naturalism, instrumentalism, logical positivism and existentialism, such as Russell, Dewey, Perry, Lewis, Bridgman, Carnap, Urban, Ayre, Moore, Ross, Alexander, Sartre, Schlick, Stace, Ducasse, Maritain, and others.

24.615, 24.616 Philosophical Ideas in America Prep. 24.602
or 36.602; 4 hrs.
Jonathan Edwards to the present, and analyses of readings from Edwards, Woolman, Jefferson, Paine, Emerson, Pierce, Royce, James, Santayana, Dewey, and others, with particular consideration of their reflection of or influences upon the American cultural milieu.

25 — Psychology

25.601, 25.602   General Psychology   4 hrs.
An introductory survey of the general field of psychology. Emphasis is placed upon the experimental approach to the study of behavioral data including growth and development, learning, perception and motivation. The sensory basis of response, individual and group differences, mental testing, attitude formation, personal adjustment, and historical backgrounds of psychology.

25.605   Child Psychology   Prep. 25.602; 2 hrs.
The growth and development of infants and young children. Systematic study is made of their characteristic patterns of behavior, motivations, needs, and cultural influences.

25.606   Adolescent Psychology   Prep. 25.602; 2 hrs.
Develops growth patterns of later childhood and preadolescent behavior and their implications for adult life. Parental functions, problems pertaining to adolescence and their relationship to society and cultural influences are discussed.

25.607   Psychology of Personality   Prep. 25.602; 2 hrs.
Approaches to the understanding of personality are made through a review of the physical, mental, and emotional development of the individual and of the social influences upon him. Several of the more prominent theories in the field are considered and case material is presented. Some concentration is placed on minor personality maladjustments.

25.608   Social Psychology   Prep. 25.602; 2 hrs.
Stresses the psychological principles underlying human relations with emphasis upon the social influences that guide our everyday behavior. The relation of man to the group. Motivation, attitudes, personality in social behavior.

25.609   Industrial Psychology   Prep. 25.602; 2 hrs.
Psychological techniques in the selection and placement of employees, use of psychological tests in industry, and the evaluation of the human factors leading to optimal working efficiency and job satisfaction.

25.621   Motivation   Prep. 25.602; 2 hrs.
Survey of the various aspects of motivation. Such areas as primary and secondary reinforcement, unconscious motivation, effectance motivation, and the assessment of motives will be considered.

25.622   Psychological Testing   Prep. 20.611; 2 hrs.
Basic principles of test theory, test administration, and test construction. Familiarization with representative types of tests.

25.623   Intelligence Testing   Prep. 25.622; 2 hrs.
Administration, scoring, and interpretation of individual intelligence tests. Supervised practice in the Wechsler Scales (WAIS and WISC) and the Stanford Binet L-M. 1960 Revision.

25.631, 25.632   Abnormal Psychology   Prep. 25.602; 4 hrs.
Abnormal behavioral characteristics. Attention is directed to the historical
development of the field with emphasis upon the theories of abnormal be-
havior, their etiology, symptoms and treatment.

25.633, 25.634   Experimental Psychology   Prep. 25.602; 6 hrs
The methods and techniques for the design, execution, and interpretation
of psychological experiments. Laboratory instrumentation and research
methodology in the investigation of the sensory processes, perceptual-
motor behavior, motivation, and learning. 2 class hours plus 2 laboratory
hours.

25.641   History of Psychology   Prep. 25.634; 2 hrs.
Current status of psychology among the sciences in the light of its history.

25.642   Systems and Theories of Psychology   Prep. 25.641; 2 hrs.
Major schools of psychology which have influenced the development of mod-
ern psychology. Contemporary systematic trends and their historical de-
velopment.

25.671   Seminar in Psychology   Prep. 25.641; 2 hrs.
Discussion of current problems in psychology.

27 — Fine Arts

27.601   Introduction to the Arts   2 hrs.
Introduction to the techniques and meanings of various artistic expressions.
The stylistic, esthetic and social factors of painting, sculpture, drawing,
architecture and graphic art are studied in detail. The major stress of the
course is on the visual arts.

27.602, 27.603   General Survey of Western Art   4 hrs.
A history of Western art from prehistoric times to the Twentieth Century.

27.604   Ancient Architecture   2 hrs.
Developments in the builder's art from prehistoric times to the end of the
Classical Era, with emphasis on building methods, materials, and styles as
they developed.

27.605   Medieval and Renaissance Architecture   2 hrs.
A continuation of Ancient Architecture, this course includes a study of
architecture from the Early Christian Period through the Renaissance.

27.606   Modern Architecture   2 hrs.
A continuation of Medieval and Renaissance Architecture, this course deals
with developments in the Seventeenth, Eighteenth, and Nineteenth Centu-
ries, and those influences which have given rise to the leading styles of
today.

27.607   History of Ancient Art   2 hrs.

The materials and techniques of ancient artisans in architecture, sculpture, and paintings. This semester of the course includes a survey of prehistoric art, and the arts of ancient Egypt, Mesopotamia, Crete and Greece. Lectures are illustrated with slide projections and include brief historical accounts of each period under discussion.

27.608   History of Medieval Art   2 hrs.

Beginning with a study of ancient Rome and its people, this semester of the course includes a study of Roman art and architecture, Early Christian art, Christian symbolism, Byzantine art, Romanesque, and Gothic. Lectures include brief historical accounts of each period under discussion and slide projections.

27.609   Modern Painting   2 hrs.

The development of painting from Nineteenth-Century Romanticism to the present day. Includes a detailed examination of the social, technical, and philosophical factors involved in the various schools of painting in contemporary American and European art. Emphasis is placed upon the works of French impressionists, post impressionists, German expressionists, realists, surrealists, and contemporary abstraction. The works of Van Gogh, Gauguin, Seurat, Picasso, Braque, Miro, Kirchner, Munch, Klee and Kandinsky are studied in detail. Includes museum and art gallery visits and lectures.

27.612   European Art   2 hrs.

Traces the stylistic, social, technical and historical development of painting, sculpture, and architecture from the late Sixteenth Century up to the end of the Nineteenth Century Romantic Period in northern and western Europe. The artistic expressions of El Greco, Brueghel, La Tour, Rubens, Frans Hals, Rembrandt, Velasquez, Poussin, Watteau, David and others are studied in detail.

27.613   Italian Renaissance Art   2 hrs.

Beginning with a study of Early Renaissance architecture and sculpture, then concentrating on Early Renaissance painting. The course traces the development of Italian art from the time of Brunelleschi, Ghiberti, and Giotto to the age of Leonardo Da Vinci. The study of the High Renaissance includes painting, architecture and sculpture. The works of Michelangelo, Raphael and the Venetian school are studied in detail.

27.614   Spanish Art   2 hrs.

The study of Spanish art and painting from the Renaissance to the Nineteenth Century. The work of such major painters as El Greco, Velasquez, Goya, and Zinbaran is studied.

27.615   French Art   2 hrs.

A detailed study of French painting and sculpture from the Renaissance period to the Nineteenth Century. Emphasis is placed upon the styles, technique and design of the work of such major figures in French art history as Poussin, Watteau, David, Delacroix, and Ingres.

27.616   English Art   2 hrs.
English painting and sculptures from the Renaissance to the Nineteenth Century. The work of the major figures in English art are studied in detail; for example, Hogarth, Gainsborough, Reynolds, Turner, and Blake.

27.621   History of American Art I   2 hrs.
The development of American art from colonial times to about 1860. The object of this course is to acquaint the student with the rise of architecture, sculpture, and painting in America. Lectures include discussion of techniques, styles, methods, and materials employed during the periods considered. Slide projection lectures and visits to the Museum of Fine Arts are included.

27.622   History of American Art II   2 hrs.
Begins with the Civil War Period and includes a study of American architecture, sculpture, and painting up to the present. Particular attention is given to the work of Henry Hobson Richardson, Louis Henry Sullivan, and Frank Lloyd Wright. Lectures are illustrated with slide projections, and a visit to the Museum of Fine Arts is included.

27.623   Oriental Art I   2 hrs.
Chinese and Japanese painting and sculpture. Detailed study of the major periods in Chinese painting.

27.624   Oriental Art II   2 hrs.
Indian art and the philosophical and religious subject matter involved. The styles, techniques, and design of Indian sculpture and painting are studied in detail.

27.625   Russian Art   2 hrs.
Russian art from the Tenth Century to the present, with emphasis on the study of iconography, art of St. Petersburg, and the concept of Socialist realism in modern Russian Art.

27.626   African Art   2 hrs.
Various stylistic characteristics of sculpture and other artistic expression of the major cultures of Africa from the Thirteenth to the Twentieth Century.

27.627   American Indian Art   2 hrs.
Pre-Columbian and past-Columbian art forms of the American Indians. Architecture, sculpture, painting, and the decorative arts are considered.

27.643   Art Seminar   2 hrs.
Specific techniques, problems, and theories in art. Students will be responsible for certain research projects.

28 — Music

28.601   Introduction to Music   2 hrs.
The principal concern is to teach the student a technique for listening actively and perceptively to music. It is designed for non-musicians. It surveys and analyzes representative serious works from a basic standard repertoire.

28.604 Aspects of Romantic Music   2 hrs.

Musical styles of the Nineteenth Century, styles which still dominate musical tastes in the Twentieth Century, a comparative study of the two everenduring artistic polarities — Classicism and Romanticism; a detailed study of romantic realism (program music) and romantic idealism (personal expression) that followed Beethoven. Composers to be studied will include Tchaikovsky, Brahms, Wagner, Liszt, Berlioz, Mahler, and others.

28.605 The World of Musical Comedy   2 hrs.

America's home-grown "opera." An historical survey and analytic study of musical shows from **The Black Crook** (1866) to **My Fair Lady** and **West Side Story.** Major works by Romberg-Kern, Gershwin, Rodgers and Hammerstein, Lerner and Lowe, Bernstein, and others will be studied. The course is intended to show the gradual change from melodrama and revue to the sophisticated comedies and quasi-tragedies of the present day musical theater.

28.606 The World of Opera   2 hrs.

An introduction to the exciting world of opera. An important comic and tragic opera will be selected for study out of each great operatic era. Distinctions will be made between music drama and the number opera. Students will be required to acquire librettos. Aria, recitative, ensemble and other basic elements of opera will be isolated and discussed. Course will conclude with the study of a complete opera.

28.610 Beethoven   Prep. 28.601; 2 hrs.

An analysis of the complex personality and art of this supreme musical genius. He will be related to the turbulent times in which he lived. His role as the great transition figure in the passage from classicism to romanticism will be studied. Symphonies, sonatas, chamber works, and vocal works will serve as examples. His psychological and aesthetic growth will be observed by studying similar forms written in different periods of his life.

28.611 Concerto   Prep. 28.601; 2 hrs.

The evolution of the concerto from its origins in the Baroque Period to its use in our time. The study of its form. The concerto seen as a sonata for soloist or soloists and orchestras. The concerto studied in relation to other important forms in music. Concerto for every instrument are studied. Concertos for piano, violin, cello, horn, organ, bassoon, etc. Composers studied: Vivaldi, Bach, Mozart, Beethoven, Brahms, Schumann, Rachmaninoff, Mendelssohn, Tchaikovsky, etc.

28.612 Contemporary Music   Prep. 28.601; 2 hrs.

The study of contemporary music as a continuum with the general evolution of music. Contemporary music is seen as a mirror of our time just as music has always reflected that age that brought it about. The major composers studied: Stravinsky, Debussy, Ravel, Bartok, Prokofiev, Hindemith, Milhaud.

30 — English

30.601, 30.602   English   4 hrs.
Review of grammar and punctuation through drill. A study of the tech-
niques of exposition, description, argumentation, narration, and documen-
tation; frequent theme assignments to develop skill in writing; related
readings.

30.603   Introduction to Literature   2 hrs.
Short stories, plays, and poems. Writing of short critical papers.

30.604   Business Writing   2 hrs.
Detailed study of the business letter and other forms of writing required of
the trained man in business — exclusive of the report. Special emphasis is
placed on vocabulary improvement and efficiency of communication.

30.605   Business Reports   2 hrs.
Analysis of the different types of business and semitechnical reports, for-
mat, and documentation. Illustrated lectures on research techniques and
reference sources. The preparation of reports.

30.606   Technical Writing I   Prep. 30.602 or equiv.; 2 hrs.
Development of technical writing, editing, and graphic arts. Types of techni-
cal documentation, including reports, handbooks, parts lists, information
retrieval, programmed instruction, and reproduction processes. Emphasis on
practice in technical writing and preparation of graphic aids.

30.607   Technical Writing II   Prep. 30.606; 2 hrs.
Various types of technical reports and proposals prepared in industry, in-
cluding progress, engineering, design final, and film. Preparation of charts,
graphs, and various art work; proposals and journal articles. Considerable
practice in technical writing.

30.608   Advanced Composition   Prep. 30.602; 2 hrs.
Practice in expository and imaginative writing in a variety of forms, de-
signed to help the student discover his own style. Individual attention to
the work of each student.

30.609   Creative Writing   Prep. 30.608; 2 hrs.
A workshop in writing, analyzing, and editing short fiction. Weekly assign-
ments in varied styles and techniques are read in class, and problems of
the author or the audience are discussed. Suggestions from the class are
incorporated in the rewriting process, which is reviewed and graded by the
instructor.

30.610   The English Language   Prep. 30.602, 30.603 or equiv.; 2 hrs.
An introduction to the scientific study of the nature of the English language.
The backgrounds and historical development of the language are studied
through sounds, grammar, and usage. The problem of meaning and the
symbolic nature of language are discussed.

30.611   Introduction to Semantics   Prep. 30.602, 30.603 or equiv.; 2 hrs.
The ways in which language habits affect thinking processes and raise prob-
lems in social relationships. Meaning as communicated through language.

30.612   Introduction to Journalism   Prep. 30.608; 2 hrs.
The functions of the editorial department and the general tasks of an "in-
side" man; the problems of reporting and newswriting. The student is given
extensive practice in the rewriting of news stories.

30.613   Techniques of Journalism   Prep. 30.612; 2 hrs.
A general practice course in newspaper writing; the covering of special as-
signments; editing the news; writing of editorials, feature articles, and
columns.

30.618   Effective Speaking I   2 hrs.
Selection and organization of speech materials, essentials of good platform
delivery; individual and class criticism of both prepared and impromptu
speeches; a practical course devoted to developing an ability to speak
easily, naturally, and forcefully.

30.619   Effective Speaking II   Prep. 30.618; 2 hrs.
Principles of speech composition; analysis of speech patterns which involve
evidence and reasoning as factors in convincing and persuading; group dis-
cussion, debate, and study of related areas such as parliamentary proce-
dure, radio and television speaking, and interpretation.

30.621, 30.622   Western World Literature I   4 hrs.
A study of books that have influenced mankind. Each assigned text is pre-
sented with sufficient reference to its national background to provide topical
understanding but without prejudice to its primary significance as mem-
orable literature, a product of the creative spirit of man. Student's attention
is drawn to great achievements in poetry and prose by writers in Greek,
Latin, and Hebrew; he is then in a position to appreciate the uses made
of a great literary inheritance by medieval and Renaissance authors.

30.623, 30.624   Western World Literature II   4 hrs.
Devoted to the study of literature that has influenced mankind and is in-
tended to provide an illuminating survey of comparatively modern writing.
Beginning with the neoclassic writers of France and England, the student's
attention is focused on such influential authors as Voltaire and Rousseau
and then on celebrated poets and novelists of the nineteenth century.

30.625   English Literature to 1800   2 hrs.
A survey course of English literature. After a brief study of the social and
political background of each literary period, the writing of the period is
considered, and the more important writers are studied and read in detail.
The course will give the student an appreciation of English literature as a
whole, and an intimate knowledge of its major figures.

30.626   English Literature Since 1800   2 hrs.
A survey course of English literature. The outstanding writers are read, studied, and related to the general background of nineteenth century England. The course will give the student an understanding of the writers who contributed most to the formation and development of modern literature in England.

30.627   American Literature to 1860   2 hrs.
A survey of American literature from colonial times to the triumph of the transcendental movement in New England. The work of Byrant, Irving, Cooper, Poe, Emerson, Thoreau, Lowell, Holmes, Longfellow, and Melville will be emphasized.

30.628   American Literature Since 1860   2 hrs.
A survey of American literature from the Civil War, to include the rise of realism, the development of American humor, the appearance of local color writers, and modern trends since 1900.

All students enrolling in Course 30.629 or above should have completed 30.603 and one full-year survey course (taken from those listed as 30.621 to 30.628) or secure the approval of the Dean.

30.631, 30.632   Restoration and Eighteenth-Century English Literature   4 hrs.
Principal authors from 1660 to 1780 will be studied in relation to the political, social, and religious thought of the period. Stress will be upon the works of Dryden, Pepys, Butler, Bunyan, Addison, Defoe, Swift, Pope, Burke Johnson, Goldsmith, Boswell, Gibbon, and Tom Paine.

30.633, 30.634   Romantic Poets of the Nineteenth Century   4 hrs.
Against the background of Romanticism, students will study the poetry of Wordsworth, Coleridge, Shelley, Keats, and Byron. The Victorian works, especially of Tennyson and Browning, will be followed by the pre-Rafaelites Rossetti, Morris, and Swinburne.

30.635, 30.636   The English Novel   4 hrs.
The English novel will be viewed as a political and social instrument, with emphasis on artistic and psychological aspects, and the permanent concern of the novel with human character. The first semester will include: Defoe, Richardson, Fielding, Smollet, Stern, Walpole, Radcliffe, Beckford, Austen, and Scott. The second semester will be concerned with: Dickens, Thackeray, the Brontes, Trollope, Eliot, Meredith, Hardy, Bennett, Moore, and Kipling.

30.637   English Drama   2 hrs.
A critical and historical study of English dramatic literature and the British theatre, with special attention to the major developments that parallel British literature and culture. Planned to round out the student's knowledge of literature and civilization.

30.638 Modern Drama 2 hrs.
Representative plays by significant dramatists from Ibsen to Miller with emphasis on the emergence of realism, naturalism, and expressionism; the dramatist as a social critic; and the impact of science and psychology on the dramatic literature of our times.

30.641, 30.642 Chaucer 4 hrs.
Chaucer's poetry, with careful attention to Middle English vocabulary, historical setting, and general critical considerations. During the first semester emphasis will be placed on the "Canterbury Tales." In the second semester other works will be studied, including "Troilus and Criseyde," "The Parliament of Fowls," "The Legend of Good Women," and short poems.

30.643, 30.644 Shakespeare 4 hrs.
The status of the theatre in Elizabethan London will be studied in relation to the economic and political situation of the times. Shakespearean criticism from a scholarly viewpoint will be considered. The main emphasis will be on an intensive study of selected comedies, histories, and tragedies. The first semester will include "Comedy of Errors," "Midsummer Night's Dream," "Twelfth Night," "Romeo and Juliet," and "Henry IV" part I. The second semester will include "Hamlet," "Othello," "Macbeth," "King Lear," and "The Tempest."

30.645 Spenser 2 hrs.
"The Faerie Queene" will be studied as the English culmination of medieval and Renaissance romantic narrative. The art of the entire poem and the moral allegories of the different stories it tells will be interpreted against the background, political and ethical, of Elizabethan England.

30.646 Milton 2 hrs.
Introduction to "Paradise Lost." Primary emphasis will be placed on a close study of the text, but an attempt will be made to furnish such political and theological background as will promote a full understanding of this many-faceted poem. "Paradise Regained" and "Samson Agonistes" will also be read.

30.647 Conrad 2 hrs.
Conrad's art related to his Polish heritage, nautical career, theory of life and composition, and literary legacy.

30.651 American Short Story 2 hrs.
Stress upon the development of the American short story from the early Nineteenth Century to the present. Authors whose works are discussed include: Poe, Hawthorne, Harte, Freeman, Jewett, O. Henry, Steele, Lardner, Hemingway, and Faulkner.

30.652 American Novel 2 hrs.
A survey of American fiction to the end of the Nineteenth Century. Special attention will be given to the novels of Brown, Cooper, Hawthorne, Melville, Twain, James, and Howells. Discussion includes readings, lectures, and reports.

30.653   American Drama   2 hrs.
A critical and historical study of American dramatic literature and the American theatre, with special attention to the major developments that parallel American literature and culture. Planned to round out the student's knowledge of American literature and civilization.

30.654   Contemporary American Poetry   2 hrs.
This course will acquaint the student with the poetry of his own time and to help him understand and enjoy poetry generally. It will deal with verse written by American poets, especially during the period of the last fifty years, concentrating on contemporary work. There will be some analysis of the technical aspect of the poems, and both form and content will be examined in relation to the revolutions of the age in which we and these poets live.

30.655   Modern American Novel   2 hrs.
Some of the outstanding American novels of the Twentieth Century, with emphasis on the social outlook they imply. Norris, Dreiser, Lewis, Dos Passos, Hemingway, Steinbeck, and others.

31 — French

31.601, 31.602   Elementary French   4 hrs.
Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple French prose. Develops into the reading of more difficult work accompanied by practice in conversation.

31.603, 31.604   Intermediate French   Prep. 31.602; 4 hrs.
A review of grammar. Reading of French prose of moderate difficulty. Emphasis is placed upon the acquisition of reading and conversational ability through the use of written and oral exercises.

32 — German

32.601, 32.602   Elementary German   4 hrs.
Stresses the essentials of grammar, practice in pronunciation, and the acquisition of a basic vocabulary; the study of idiomatic expressions and use of subjunctive mood. Develops into the reading of more difficult work accompanied by practice in conversation.

32.603, 32.604   Intermediate German   Prep. 32.602 or equiv.; 4 hrs.
Reading of German prose of moderate difficulty, with practice in conversation. Introduction to the history of German civilization through texts of average difficulty, review of grammar, oral and written exercises.

33 — Spanish

33.601, 33.602   Elementary Spanish   4 hrs.
Stresses the essentials of grammar, practice in pronunciation and progressive acquisition of basic vocabulary and idiomatic expressions. Written and oral exercises are based upon simple Spanish prose. Develops into the reading of more difficult work accompanied by practice in conversation.

33.603, 33.604   Intermediate Spanish   Prep. 33.602 or equiv.; 4 hrs.
A review of grammar. Reading of Spanish prose of moderate difficulty with practice in conversation. Emphasis is placed upon the acquisition of reading and conversational ability through the use of oral and written exercises.

34 — Russian

34.601, 34.602   Elementary Russian   4 hrs.
An introductory course starting with the Russian alphabet; stress is placed on grammar, practice in pronunciation, acquisition of a basic vocabulary and idiomatic expressions. Written and oral exercises are based upon simple Russian prose accompanied by practice in conversation.

34.603, 34.604   Intermediate Russian   Prep. 34.602 or equiv.; 4 hrs.
Reading of Russian prose of moderate difficulty, including some attention to scientific writings, with practice in conversation. Emphasis is placed upon the acquisition of reading and conversational ability through the use of oral and written exercises.

34.605, 34.606   Russian Literature of the Nineteenth Century   Prep.
34.604; 4 hrs.
Survey of the developments of Russian prose literature during the Golden Age. Representative readings from Pushkin, Lermontov, Gogol, Turgenev, Tolstoi, and Chekhov.

36 — Sociology

36.601, 36.602   Principles of Sociology   4 hrs.
A perspective of sociology basic to a general knowledge of the field. The origins, forms and forces of human associations are discussed, including a systematic treatment of group life, social institutions, social processes, social change, and social control. To meet the needs of the student who desires only an elementary survey of the subject, as well as the student who plans to take advanced courses in social science.

36.603, 36.604   Social Problems and Disorganization   Prep. 36.602; 4 hrs.
Stresses complex causation, and interrelatedness of social problems in general. Cultural change, with its attendant lags, as well as other social forces and conflicts. Emphasis is given those pathological conditions which exist in relations between the individual and the group.

Major social problems, such as prostitution, crime, delinquency, alcoholism, divorce, desertion, mental deficiency, suicide and group conflict. The theory of institutional conformity and non-conformity, retribution, and reform.

36.605   Physical Anthropology   Prep. 36.602; 2 hrs.
Examination of the mode of biological evolution together with fossil evidence proving its occurrence. Student becomes acquainted with man's place in nature. A survey of heredity, race and the evolution of behavior leading to an understanding of the biological bases of society and culture.

36.606   Cultural Anthropology   Prep. 36.602; 2 hrs.
Cultural origins and change through time and space as approached through archaeology and ethnology; uniformities, differences, transmission and diffusion of cultures. Consequences of cultural concept in modern thought, racism, cultural relativity, cultural cycles, culture and personality; the relation of anthropology to the other social sciences.

36.608, 36.609   American Culture   Prep. 36.602; 4 hrs.
The ethos of the United States through study of its social institutions; familial, economic, political, educational and religious. Consideration is given to social classes and stratification, to include subcultures and cultural integration; mobility; and the basic value system.

36.610, 36.611   Juvenile Delinquency   Prep. 36.602; 4 hrs.
Causation, and prevention of juvenile delinquency. Development of the Juvenile Court and the Youth Authority programs; analysis of probation, parole, and institutional treatment of juvenile delinquents. Evaluation of various prevention programs; case histories.

36.612, 36.613   Criminology   Prep. 36.602; 4 hrs.
The nature and causes of crime, the criminal as a social problem, judicial agencies and procedures with past and present theories and penological practices. Procedures in adult courts, juvenile courts, and family courts. Prison systems as practiced both in Europe and the United States. Classification. Prison labor. Education within prisons. The theory of punishment as a deterrent. The individualization of treatment. Child guidance clinics. Youth service boards. The Borstal System. Social and cultural factors affecting crime. The place of psychiatry, social work, and religion in criminal treatment. The value and effectiveness of probation, parole, and indenture methods of treatment.

36.614   Social Service I   Prep. 36.602; 2 hrs.
A survey of welfare agencies. Their origins, functions, and methods of operation. Problems of agencies involving health, child care, legislation, population distribution, etc. Emphasis is placed upon voluntary and state agencies and laws applicable to them.

36.615   Social Service II   Prep. 36.614; 2 hrs.
Federal agencies and laws applying to their administration. The role of the Federal Government in national welfare and relief. Medical, economic, political problems encountered in agency management. Privileges and rights of a United States citizen under social service laws are reviewed.

36.616   Preparation for Marriage   2 hrs.
Basic factors of courtship, mate selection, engagement, marriage, and rearing children in preparation for successful marriage and parenthood. Psychological, medical and theological prerequisites to marriage. Marital values and problems, e.g., recreation, education, religion, child guidance, divorce, etc.

36.617   The Family   2 hrs.
Comparison and contrast of the American family with other Occidental and Oriental forms, both ancient and contemporary. Current changes in family life and causes. Genic and psychogenic conditioning, relationship between family members. Relation of the family to the social sciences and the promotion of education of young people for family life, marriage and parenthood.

36.618   Race Relations and Cultural Contact   Prep. 36.602; 2 hrs.
Racial traits and cultural associations in the United States and other regions. The differences between "race" and "culture" — race the biological concept, culture a universal maturing process. The problems of races and nationalities. Race conflicts and exploitation. Contemporary doctrines of racialism. An analysis of race differentials and culture differences. An attempt to reach scientific conclusions pertaining to the causes of biological variations and race attitudes.

36.619   Urban Society   Prep. 36.602; 2 hrs.
The modern American city, its historical background and comparison with other cities of the world. Its types, social values and problem areas are discussed as are methods of city planning.

36.620   Social Control   Prep. 36.602; 2 hrs.
Methods and basic principles of the growth and development of human relations. The nature and methods of social control, control in relation to social structure, leadership, and public opinion as factors in control, and contemporary problems of control.

36.621   The Aging in American Society   2 hrs.
The socio-cultural environment of the aged in American society. Problems of older workers in our culture, educational opportunities available, economic and financial status of retired persons, and responsibilities of society for aiding in individual adjustment. An endeavor to understand older persons as physical, psychological, and social entities.

36.622, 36.623   Social Theory   Prep. 36.602, 36.604; 4 hrs.
Social thought from ancient times to the more modern theories. The origins, aims, and accomplishments of the social science movement and sociology are studied. Contributions of men since the early nineteenth century are later examined, including Spencer, Marx, Sumner, Ward, Gumplowicz, Durkheim, Pareto, and Thomas.

41 — Accounting

41.601, 41.602   Introductory Accounting   4 hrs.
Basic course for students specializing in accounting. No previous knowledge of bookkeeping or accounting necessary. Essential bookkeeping procedures covered, with sufficient practice to provide a sound foundation for advanced work. Simple accounting principles also discussed.

41.603, 41.604 Intermediate Accounting Prep. 41.602; 4 hrs.
Continuation of Introductory Accounting. Various forms of business organization. Accounts for manufacturing businesses introduced and additional accounting principles. Financial statements for trading and manufacturing businesses prepared.

41.605, 41.606 Accounting Problems Prep. 41.604; 4 hrs.
Advanced accounting principles covering preparation of financial statements, treatment of capital stock, treasury stock, retained earnings, cash, receivables, inventories, fixed assets and liabilities. Emphasis placed on principles and their application to various situations.

41.607, 41.608 Advanced Accounting Problems Prep. 41.606; 4 hrs.
Terminal course in sequence accounting. Advanced accounting principles are applied to special situations such as partnerships, insolvent companies, estates and trusts, instalment sales, consignments. Second semester devoted to preparation of consolidated financial statements.

41.609 Fund Accounting Prep. 41.606; 2 hrs.
Accounts of governmental and municipal units, hospitals, charitable organizations and educational institutions are segregated by funds. Municipal budget appropriations, encumbrances and expenditures are covered as well as the special problems in accounting for each type of fund. Considerable time is devoted to the various phases of cost allocation and accounting for hospitals.

41.610 Mathematics of Accounting Prep. 14.602, 41.606; 2 hrs.
Mathematical applications in a variety of accounting situations with much time devoted to the study of actuarial science, as well as to basic arithmetical computations and some applications of algebraic formulae.

41.611, 41.612 Cost Accounting Prep. 41.606; 4 hrs.
Principles of cost allocation in job order, process, joint and by-product, and standard cost situations. Management use of cost statistics. Integration of the cost records into the general accounting system.

41.613, 41.614 Advanced Cost Accounting Prep. 41.612; 4 hrs.
Cost principles applied to a variety of situations through the case study method. Distribution and administrative cost allocation. An advanced study of management use of cost statistics.

41.615. 41.616 Internal Auditing Prep. 41.606; 4 hrs.
Verification of accounts by the internal auditing department. Study of various auditing tools and techniques, such as statistical sampling, audit working papers, and audit reports. Methods of internal control and their improvement.

41.617, 41.618 Auditing Prep. 41.606; 4 hrs.
Auditing techniques and procedures employed by independent public accountants. Practice material concerned with verification of the various

balance sheet accounts. Current developments in public accounting and bulletins and pronouncements by the American Institute of Certified Public Accountants are studied. Preparation of audit reports.

41.619   Analysis of Financial Statements   Prep. 41.606 or 41.629; 2 hrs.
Techniques used by management, creditors, investors and regulatory authorities in analysis and interpretation of financial statements for establishing credit ratings, determining investment value of business, testing operating efficiency, and proving effectiveness of financial and operating policies. Published corporate reports used extensively as case material.

41.620, 41.621   Controllership Accounting   Prep. 41.606 or 41.629; 4 hrs.
Functions and organization of the controller's department, basic techniques employed by the controller, the interpretation of historical results and their coordination into the broad policy-making program of the business. Budgeting activities of the controller.

41.622   Punch Card Accounting   Prep. 41.604 or 41.629; 2 hrs.
Designed to give accountants, methods men, and executives a working knowledge of punch card accounting, what it can do and its limitations. A comprehensive coverage of available equipment and of installation and operational techniques. Working demonstrations of various types of equipment. The course is constantly up-dated to keep pace with current developments.

41.623, 41.624   Basic Federal Taxation   Prep. 41.604 or 41.629; 4 hrs.
An introductory study of the Federal Income Tax Laws and their application to the income of individuals, partnerships, and corporations; determination of taxable income, allowable deductions, gains and losses on sales and exchanges, types and preparation of returns.

41.625, 41.626   Advanced Federal Taxation   Prep. 41.624; 4 hrs.
Detailed study and analysis of leading court cases on income taxes. Procedures in researching cases and decisions on specific problems. Court and treasury reasoning which define and interpret the Internal Revenue Code and regulations. Instruction is largely by the case method. First semester emphasizes: All aspects of Capital, Gains. Second semester emphasizes: Problems between stockholders and their corporations; dividends, stocks, loans, etc.

41.628, 41.629   Managerial Accounting   4 hrs.
The broad background of accounting and business transactions as a basis for analyzing and interpreting financial statements and accounting reports. Managerial uses of accounting and its logic and basic theory are introduced concomitantly with accounting procedures and practices.

41.630, 41.631   Accounting for Management Decisions   Prep. 41.629; 4 hrs.
The use of accounting information for managerial decision making; cost flow, cost-volume-profit relationships, flow of funds and cash, coordinated budget, cost analyses applied to decision making, planning capital expenditures, pricing decisions, and the use of qualitative techniques.

41.632   Government and Defense Contract Accounting   Prep. 41.604; 2 hrs.
Increasing percentages of business revenues arising from Defense Contracts
necessitate a need for many accounting students to have a basic knowledge
in accounting for these contracts. This course is designed to provide the
student with this knowledge through a study of the various types of con-
tracts and their specific accounting requirements, in addition to overall
coverage of governmental regulations and agencies administering these
contracts.

41.641   Accounting Seminar   Prep. 41.608,
                                              41.610, 41.614 or 41.618; 2 hrs.
The objective is to acquaint the student with the current literature in the
field. Recent publications of the American Institute of CPAs and the Amer-
ican Accounting Association will be analyzed. Areas of challenge and con-
troversy in income theory, asset valuation and price level changes will be
stressed. New reporting and accounting techniques such as flow of funds and
the application of quantitative techniques to the solution of accounting
problems will be discussed.

42 — Personnel and Industrial Relations

42.601   Introduction to Psychology for Management   2 hrs.
Basic principles of individual and group psychology as applied to practical
business problems; understanding of man's mental life; scientific methods
employed in gaining psychological knowledge, prediction and management
of human behavior in business.

42.602, 42.603   Human Relations   Prep. 42.601; 4 hrs.
A foundational course in personnel management, oriented especially to the
supervisor's responsibilities, including situation analysis; problems in
recruitment, selection and training; creation and implementation of wage
and other policies; complaints, grievances and related disciplinary pro-
cedures; employee morale; labor turnover; health and safety; employee par-
ticipation; collective bargaining; incidental public relations; elements of
effective supervision.

42.604   Personnel Management Practices   2 hrs.
The organization, function, and procedures of the personnel department. Its
relationship and responsibility in the management organization; manpower
requirements; recruitment; interviewing; counseling; selection; testing;
placement; training; job analysis and evaluation; merit rating; promotion,
transfer, discharge; employee publications; standards and conditions of
employment; personnel policies, benefits, forms, records, and reports.

42.605   Wage Administration   Prep. 42.604, 42.609; 2 hrs.
The underlying theory of industrial wages; job and salary analysis and
evaluation; merit rating; incentive wages; wage payment plans. The im-
portance of a sound wage structure to healthy employer-employee relations
and the administration of wages through collective bargaining from the
production as well as the labor relations point of view.

42.606   Employment Testing   Prep. 20.611; 2 hrs.
Selection and placement procedures; the interview, psychometric testing, references; tests used in business and industry to determine aptitudes, personal characteristics and qualifications for employment, proper job placement, counselling, promotion, special training, supervisory or executive potentialities. Tests in terms of type and purpose, test characteristics, test construction, test interpretation, use and limitations of testing.

42.607   Practical Training Methods   2 hrs.
Principles, methods and techniques used in training; a grounding in the psychology of learning; methods of analyzing and meeting training needs; techniques of effective teaching; a review of the types of training found in industry; principles and practices of organizing training activities; practical applications of training methods used in industry.

42.608   Employee Benefits and Social Security   Prep. 20.602; 2 hrs.
Private and public programs directed toward the problems of job and worker income insecurity; unemployment in a free labor market, public unemployment compensation, training and employment services; private plans to guarantee wage income and work opportunity; severance pay and reemployment rights.

Old age retirement, public pensions and survivor benefits; private pension plans and compulsory retirement. Disability from nonoccupational causes, hospitalization and medical group insurance plans and income insurance; workmen's compensation for industrial accident and disease protection. Economic, fiscal and administrative considerations in developing and operating employer and union-management programs in private business and industry.

42.609   Techniques of Supervision   2 hrs.
Controlling and co-ordinating the combined positions of managerial capacity involve the responsibility of supervision; basic instruction in supervisor's responsibilties and objectives; planning the work and employee assignments; employees' attitudes toward management; records and reports; improving individual performance; progress of employees; personnel relations; handling of grievances; training; administering of company policies; matters related to wages; the development of a congenial, enthusiastic community of work interest through the co-ordination of the work of all employees.

42.610   Labor-Management Relations   2 hrs.
A basic treatment of labor economics, including the history of the labor movement and of industrial relations; theory of collective bargaining; effect of collective bargaining upon income of labor, employment, and national income; policies and practices of labor and management in respect to hiring and layoffs, technological changes, wages and union security, union-management co-operation, government regulation of labor relations, strikes and lockouts and public policy as to industrial relations.

42.611   Labor Legislation — Union-Management Relations   Prep.
42.610; 2 hrs.
The legal framework for collective bargaining, beginning with the historical development and the impact of the anti-trust laws on labor unions; the federal and state laws regulating injunctions in labor disputes; the Railway Labor Act; the National Labor Relations Act; a detailed study of the Labor-Management Relations Act (Taft-Hartley); the procedures, powers, and limitations of the agencies administering the statutes.

42.612   Labor Legislation — Employment Standards   Prep. 42.610; 2 hrs.
The history and development of minimum wage laws, both state and federal; Federal Wage and Hour Act (Fair Labor Standards Act) regulations on hours of work, minimum wages and child labor, and state regulations. The Walsh-Healey Public Contracts Act as it affects employment practices of contractors who supply materials to the Government. The Davis-Bacon Act, Contract Work-Hours Standards Act. Administrative and enforcement procedures.

42.613   Labor Legislation — Conditions of Employment   Prep. 42.610; 2 hrs.
Substantive and administrative provisions of the Labor Management Reporting and Disclosure Act; the Social Security Act; the Massachusetts Employment Security Act; the Massachusetts Workmen's Compensation Act. The state and federal laws and regulations relating to discrimination in hiring and employment; veterans re-employment rights.

42.614   The Labor Agreement   Prep. 42.610; 2 hrs.
The nature and content of labor contracts; component clauses such as union recognition and security, management prerogatives, seniority, vacations, wages, hours, working conditions; grievance analysis and arbitration procedure. Case studies in actual labor-management relations affected by such clauses; the entire collective bargaining agreement and relationship.

42.615   Negotiation, Mediation, Arbitration   Prep. 42.610; 2 hrs.
Technical aspects of the collective bargaining process; preparation and negotiation of demands and revising of agreement terms; the mediation process; fact-finding by neutral third parties; arbitration by neutrals; tripartite fact-finding and arbitration; grievance arbitration and processing; enforcement of voluntary agreements to arbitrate; compulsory arbitration, seizure, and other alternatives to the right to strike.

42.641   Labor Relations Seminar   Prep. 42.610,
42.611, 42.613, 42.614; 2 hrs.
An advanced discussion of current labor-management problems such as union responsibilities, management responsibilities, the annual wage, profit sharing, criteria for wage determination, welfare programs.

43 — Marketing

43.601, 43.602   Principles of Marketing   Prep. 20.602; 4 hrs.
The economic and sociological aspects of marketing a product or service from the producer to the ultimate consumer, exploring all of the interrelated factors and management tools involved in the various channels and processes.

43.603 Principles of Salesmanship   2 hrs.
Analyzes the basic needs, desires, tastes, habits that turn prospects into
customers; their individual differences — the secret to the art of persuasion;
the attempt at encouraging people to sell themselves; factors which turn
refusals into sales.

43.604   Techniques of Salesmanship   Prep. 43.603; 2 hrs.
A techniques course operated on the laboratory-lecture method in which
psychological principles are applied to the basic aspects of selling.

The student learns through visual aids, role-playing techniques, student dem-
onstrations using modern effective equipment and techniques, guest lec-
turers, etc., the proper methods of approach, how to arouse the buying urge,
the common obstacles met in selling, the meeting of sales resistance, the
closing of the sale, etc.

43.605   Sales Promotion   Prep. 43.602, 43.609; 2 hrs.
Function of sales promotion; development of plans and materials for stimu-
lating sales; consideration of publicity media; the preparation of direct
advertising pieces for use among the sales force of the manufacturer or
wholesale distributor; functions and uses of direct advertising, direct-mail
advertising and radio advertising; the planning of sales campaigns; co-ordi-
nating advertising and sales efforts; the preparation of sales manuals, dis-
play techniques, portfolios, etc., for use of the sales force.

43.605   Sales Promotion   Prep. 43.602, 43.609; 2 hrs.
The function of the sales manager, aspects of planning, investigation of the
market, pricing the product, planning the sales effort; management and
control of the sales personnel and sales operations, the types of sales
organizations, sales policy, sales campaigns, financing of sales, and the
selection, training, and supervision of the sales force; compensation, stimula-
tion and evaluation.

43.607   Sales Executive Training   Prep. 43.604; 2 hrs.
An advanced level study of the comprehensive functions of the Sales Manager
with special emphasis on the personnel aspects of sales management, hiring,
training of salesmen and sales supervision, planning, supervision, motivation,
appraisal and the handling of typical personnel problems that confront a
Sales Manager.

43.608, 43.609   Principles of Advertising   4 hrs.
The nature and scope of advertising and its place in the commercial and
economic structure; history, definition and functions of advertising; organi-
zation and functions of advertising departments and advertising agencies;
varieties of advertising and media; problems, market investigation, planning
campaigns; laws, ethics, and regulations, with special emphasis on current
trends and developments.

43.610   Advertising Management   Prep. 43.602, 43.609; 2 hrs.
Advanced course relating advertising principles to specific marketing prob-
lems, creative aspects of advertising, coordination and integration of ad-
vertising and promotion with the total marketing effort, analysis of overall

advertising and promotional objectives, development of strategy, and selection and application of "promotional mix."

Emphasis on the management function, including study of markets, sales analysis, types and use of controls, use of advertising research, measurement of advertising effectiveness, methods of establishing budgets, and criteria for media selection. Actual cases and laboratory sessions.

43.611 Advertising Copy, Layout and Production Prep. 43.602, 43.609; 2 hrs.
The creative aspects of advertising, analysis of products, markets, and media, basic appeals and psychological factors, stimulation of demand, and use of magazine advertising, direct mail, television, radio, outdoor, transit ads and other media.

Preparation of advertisements to meet specific problems, including actual layout and copy. Emphasis on five musts of effective copy, and converting basic idea into effective visual and verbal communications.

Methods and techniques of advertising production and use of typography, campaign planning, merchandising techniques, copy testing and measurement of advertising effectiveness.

43.612 Industrial Marketing Prep. 39.602; 43.602; 43.609; 2 hrs.
Principles of marketing as they apply to all non-consumer-type markets. Practices, problems, and policies of selling to industrial markets, the dynamic aspects of present day industrial marketing concepts, and applications of product development, distribution channels, personal selling, advertising, sales promotion, sales management, pricing, physical handling, financing, and the control function.

43.613 Market Research Prep. 43.602, 39.611; 2 hrs.
Organization of market research in the marketing function, techniques of research investigations, planning of mail and field investigations, preparation of material, testing results, interpretation of findings, preparation of reports leading to the development of new products sales methods or sales areas.

43.615 Purchasing I 2 hrs.
Principles, organization, procedure, quality, selecting sources of supply, price policies forward and speculative buying, forms and records.

43.616 Purchasing II Prep. 43.615; 2 hrs.
Value analysis, inventory control, inventory systems, nature of the supply market, data processing techniques, popular approaches, the profit and loss test, arithmetic of costs, contracts, the legal status of the purchasing officer, and appraising the performance of the Procurement Department.

43.617 Retail Store Management 2 hrs.
Development of modern retail organizations, including smaller and larger retail stores, store location and layout, personnel management, wage payment methods, selling services, receiving and marking procedures, mail and telephone orders, adjustments, delivery of merchandise, retail accounting and control, and store protection and maintenance.

43.618   Retail Store Merchandising   Prep. 43.617; 2 hrs.
Fundamental principles of retail store merchandising, including determination of customer demands, purchase planning, pricing, markups and markdowns, merchandise inventories, turnover, merchandise policies, and retail sales promotion. Particular emphasis is given to the emerging pattern of retailing in this country, including the growth of suburban stores, discount stores, and self-service operations.

43.620   Principles of Public Relations   2 hrs.
A survey of the beginnings and growth of public relations covering such aspects as: definitions, how public relations serves management, "image building," necessary administrative systems, working with the mass media of communications, relationships with advertising, establishing public relations objectives, writing for public relations purposes, values to management and the public, planning events and functions for public relations purposes, timing and scheduling.

43.621   Public Relations Techniques and Practices   Prep. 43.620; 2 hrs.
How a public relations program is implemented; the day-to-day operations of public relations techniques; examination of the major PR outlets including daily newspapers, weekly newspapers, radio, television, magazines, wire services; the place and uses of photography; writing for public relations purposes; legal considerations; placement, timing, and "tie-in" considerations.

43.641   Marketing Management Seminar   2 hrs.
Incorporates recent development in the behavioral sciences such as applied economic theory, social psychology and operations research; marketing alternatives such as product variation, marketing channels, price, advertising, personal selling and the location of the company's operations. In deciding which particular combination of these alternatives to use in order to solve a given marketing problem, the student is forced to consider the following: competition, demand, cost, the structure of distribution and the law.

44 — Insurance

44.601, 44.602   Insurance Principles   4 hrs.
Basic principles of insurance and risk in the areas of life, property and casualty; types of insurance; organizations in the field of insurance.

44.603   Insurance for Management   2 hrs.
Risks present in modern business operations; procedures to be taken with types of insurance used to indemnify against anticipated losses.

44.604, 44.605   Casualty Insurance   Prep. 44.602; 4 hrs.
Workmen's compensation, employers' liability, accident and health, general liability and miscellaneous crime coverages and attention to policy contracts and various provisions.

44.606   Insurance Law   Prep. 44.602; 2 hrs.
The legal areas specifically applicable to the insurance industry; policy provisions, policy contests, waiver and estoppel, trusts, fiduciaries.

44.607   Estate Planning   Prep. 44.602; 2 hrs.
Tax and legal problems peculiar to estate planning; general techniques and applications of estate planning.

44.608   Rates and Rate Making   Prep. 44.602; 2 hrs.
Detailed examination of mortality tables, the elementary aspects of life insurance rate calculation, the calculation of reserves, the calculation of nonforfeiture values and management of surplus.

44.609, 44.610   Life Insurance   Prep. 44.602; 4 hrs.
Life Insurance and its place in planning an estate; policy provisions; rate determination; net cost of insurance; legal aspects of life insurance are among the topics considered.

44.611, 44.612   Property Insurance   Prep. 44.602; 4 hrs.
A study of the standard form policy and specific problems of fire insurance, automobile insurance and marine insurance are included.

44.613   Business Insurance   Prep. 44.602; 2 hrs.
Business uses of life and health insurance, including key man and business continuation insurance for proprietorships, partnerships and corporations are examined in this course.

44.614   Group Insurance, Health Insurance and Pensions   Prep. 44.602; 2 hrs.
Analysis of group insurance plans, contracts, rate making and underwriting of health insurance, pension plans and problems of old age unemployment, and disability.

44.640   Seminar in Property and Casualty Insurance   Prep. 44.602; 2 hrs.
A seminar course for fire and casualty insurance underwriters designed to deal with the specific problems of day to day fire and casualty underwriting and to train the insurance major in the intricacies of fire and casualty underwriting problems.

45 — Business Management

45.601   Introduction to Management   2 hrs.
Basic instruction in the nature of American Business; the role of business in our society and the environment in which American Business must operate; a study of management, its role, functions, and purposes; planning, organizing, directing, controlling; business organization, its various forms and its importance to business success; methods and problems of building the organizational structure.

45.602   Functions of Management   Prep. 45.601; 2 hrs.
An analysis of the fundamental functions of management—planning, organizing, staffing, directing, and controlling. Major management principles basic to the process of management and as applied to business and government are individually examined in relation to each of the management functions. Case examples are analyzed and discussed.

45.603   Management Discussions and Conference Techniques   Prep. 30.607; 2 hrs.

Provides a knowledge of the group process; how groups develop and the effective utilization of the group as a management tool. Instruction in the planning and techniques of leading a conference; the analysis and evaluation of the group process. Classes are limited in size to allow regular and frequent participation by the students.

45.610   Office Management Practices   2 hrs.

The organizational, human, physical and operational problems encountered by the manager of the modern office; proper selection techniques, supervision, adequate compensation policies; employee relations; efficient office layout; working conditions; the analysis of office methods and systems; work simplification; the selection and use of office machines; and common office functions.

45.611   Scientific Management in Office Practice   Prep. 45.610; 2 hrs.

Basic instruction in the tools of modern scientific management, work simplification, time study, job evaluation and merit rating; work simplification as a means of improving work methods and procedures through motion study and process analysis; time study for work measurement and the establishment of standards; and job evaluation for determining the equivalency among the several jobs as a basis for a wage and salary structure.

45.612   Office Systems and Procedures   Prep. 45.610; 2 hrs.

Techniques of system design; elements of system analysis; methods of obtaining data and recording of existing procedures; procedure charts and charting techniques; developing, testing, installing, and adjusting new systems; measuring effectiveness of the system.

45.613   Forms Design and Control   Prep. 45.612; 2 hrs.

Forms, design, techniques; workers acceptance; paper, its size and quality; form composition; its construction; typography and printing specifications. The organization for control, usage, storage, and disposal all must be considered in proper forms design.

45.614   Systems Analysis and Improvement   Prep. 45.612; 2 hrs.

Tools and techniques of the systems analyst; the humanics of systems analysis; step by step synthesis of the improved system; developing recommendations; selling workers and management; writing operating procedures; installation and evaluation of the new system.

45.641   Management Seminar   Prep. all req. and prof.; 2 hrs.

Principles and problems in the specific functional areas of business — sales, finance, production, etc. The development of an integrated analysis of the situation — the top management point of view.

46 — LAW

46.601   Law I   2 hrs.
Contracts: nature, kinds and formation of contracts; essential elements; form and interpretation of contracts; breach, remedies and damages. Agency: nature, purpose, and formation of agency relationships; rights and duties of principal and agent, scope of agent's authority; rights and duties of principal and third persons; termination of agency.

46.602   Law II   Prep. 46.601; 2 hrs.
Sales: nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer. Negotiable instruments: bills, notes, and checks; requirements of a negotiable instrument; liabilities and defenses of parties; procedure upon dishonor; discharge.

46.603   Law III   Prep. 46.602; 2 hrs.
Partnerships: nature, kinds, and formation; rights and duties of partners; partner's authority to bind firm; relation of partners and third persons; dissolution and winding up. Corporations: nature and creation; powers, rights and liabilities; nature and kinds of capital stock; rights and liabilities of stockholders, directors, and officers.

46.605, 46.606   Law for Engineers   4 hrs.
Legal phases of engineering including contracts, specifications, public law, real property, zoning, professional registration, agency, patents and associated topics.

57 — Science

57.601, 57.602   General Biology I   4 hrs.
A comprehensive study of the plant kingdom. The basic principles which are developed and interpreted include: structure and importance of the cell; the properties of protoplasm; the importance of photosynthesis, evolution of plants and adaptation to their environment. Laboratory sessions consist of detailed studies of representative plants.

57.603, 57.604   General Biology II   4 hrs.
The development of the organ systems of invertebrate and vertebrate animals. Laboratory sessions include detailed studies of representative types of the animal kingdom, evolving from the protozoans to the frog.

57.608, 57.609   Medical Microbiology   Prep. 57.602
                                                   and Gen. Chem.; 4 hrs.
Pathogenicity, epidemiology of disease, Koch's postulates and immunity are stressed. Study of pathogens, including bacteria, fungi, protozoans, etc.; detailed discussions of virus diseases and action of chemotherapeutic agents. Laboratory work includes various staining procedures, preparation and utilization of specific media and detailed studies of the organisms discussed in lecture. Outside readings and reports are required. Adequate preparation in bacteriology and chemistry is required. **(An advanced level course with enrolment only with approval of the instructor)**

57.610, 57.611   Industrial Microbiology   Prep. 57.602;
                                                      and Gen. Chem.; 4 hrs.

The production of alcohol and alcoholic beverages, making of bread, butter and cheese; spoilage effects of microorganisms as well as their usefulness in biological assays. The role of microorganisms in such areas as sewage treatment, air pollution and water pollution; microbial influences on agriculture and soil fertility. Laboratory sessions include detailed studies of the processes and organisms discussed in lecture. Outside readings and reports required. Adequate preparation in bacteriology and chemistry is required. **(An advanced level course with enrolment only with approval of the instructor)**

82.601   Survey of the Physical Sciences   3 hrs.

The Universe and the Solar System; the earth, as an astronomical body and from a geological and a meteorological viewpoint; the nature of matter and energy; the elements of physics and chemistry and their applications to everyday life; the basic theory underlying atomic energy; the more recent developments in atomic research.

82.602   Survey of the Biological Sciences   3 hrs.

A brief review of the history of biology precedes a study of the cell and the essential life processes; examples of the plant and animal kingdoms, with particular emphasis on those organisms which have a direct effect on man; the flowering plants, ecology and conservation; the various human systems, with emphasis on physiology rather than anatomy; contributions of medicine; genetics and evolution.

81 — Electronic Data Processing

81.601   Electronic Data Processing   3 hrs.

Planned to acquaint the executive, accountant, methods and systems analyst with automatic electronic equipment and its potential applications. Includes a comprehensive survey of the machine components of such systems, their characteristics, and assembly to handle various business accounting problems; comparison of speed, capacity, flexibility, reliability and cost; discussion of input and output devices, memory (storage), arithmetic and control elements; elementary programming, number systems; integrated data processing in businesses, such as retail sales, inventory, payroll, and banking accounting.

81.602   Basic Computer Programming   Prep. 81.601; 3 hrs.

An advanced course to further acquaint business managers, accountants, methods and systems men, etc., with a general knowledge of programming techniques in order that they may better evaluate the capabilities of the several types of equipment designed for both small and large systems.

Includes a brief review of program concepts with particular emphasis upon the stored program technique; actual demonstrations and exercises in programming typical business applications for both single and three address systems in the University computation center; symbolic programming and automatic programming. Laboratory Fee: $30.00.

81.603   Advanced Computer Programming   Prep. 81.602; 2 hrs.
Continuation of Basic Computer Programming. The principles presented in
the basic course will be expanded upon. Concentration is placed upon pro-
gramming advanced examples using symbolic languages. Experience is
gained with Assembly Programs and remote check-out techniques using the
University computer. The organization of Subroutine Libraries and the meth-
ods of incorporating subroutines from such a library into an operating pro-
gram are covered. Basic concepts of more sophisticated programming
systems are introduced.

81.604   Advanced Programming Systems   Prep. 81.603; 2 hrs.
The sophisticated programming languages available to permit the user to
produce a running E.D.P. program more quickly. Compilers, Report Genera-
tors, Sorts, Executive and Monitor routines and their use are covered. Ex-
amples are programmed using **COBOL**, the **CO**mmon **B**usiness **O**riented
Language adopted as the standard business programming language for the
E.D.P. industry.

81.605   Business Data Processing Applications   Prep. 81.601; 2 hrs.
The application of E.D.P. techniques to specific business applications is
covered. Variations in processing requirements between industries are illus-
trated and examples are developed showing the techniques applied to their
solution and the timing and cost considerations involved. The course covers
a variety of input and output techniques including such new areas as re-
turnable media for promotion and billing operations and also communications
for operation with remote locations. Alternative approaches to updating of
files. Techniques for control and checking are presented. Capabilities of
newer systems for processing several jobs simultaneously are illustrated
through the timing of specific examples.

81.606   Data Systems Administration   Prep. 81.605; 2 hrs.
The effective use of Data Processing equipment and management sciences
in meeting the information needs of business can result only from much
study and detailed planning. This course is designed to treat the major
phases in such a program; the analysis of company objectives, the feasibility
study, the system specifications, equipment selection and the implementa-
tion of the new system.

81.607   Computer Programming for Scientific Applications   2 hrs.
Designed for people whose professional background and current occupation,
in either the physical or social sciences, require a working knowledge of
modern, problem-oriented, computer programming. Topics included are:
basic organization of a digital computer; the FORTRAN programming lan-
guage, and selected applications to typical problems.

81.608   Introduction to Operations Research   Prep. 14.603; 2 hrs.
An introduction to Operations Research for management. Following an analy-
sis of the idealized research model, a study is made of inventory models,
allocation models (including linear programming and the transportation
problem), waiting-time models (queuing theory), replacement models, and
competitive models (game theory, business games).

81.609   Operations Research Applications   Prep. 81.608; 2 hrs.
The various models that have been studied in Introduction to Operations Research are set up in more complex form and are solved using the University's computer on a closed shop basis. The FORTRAN programming language is taught and used for solving these problems.

82 — Liberal Content

The Liberal Content courses that follow are **REQUIRED** in all business administration programs leading to the Bachelor of Science Degree. These courses are an integrated unit to be completed in four years. Being sequential, each year's study becomes a prerequisite to the succeeding portion of the sequence. Beginning with the concrete and progressing to the abstract, the subject matter also increases in depth. Divided into four parts, the year courses proceed from "Man and His Physical Universe" through "Man in Society" and "Man's Cultural Inheritance" to "Man and Values."

82.601, 82.602   Man and His Physical Universe   6 hrs.
The **first semester** surveys the physical sciences. An overview of science and the scientific method; the universe and the solar system; the earth as an astronomical body and from geological and meteorological viewpoints, the nature of matter and energy. The elements of physics and chemistry and their applications to everyday life; the basic theory underlying atomic energy; the more recent developments in atomic research.

The **second semester** surveys the biological sciences. A brief review of the history of biology; the cell and the essential life processes; examples of the plant and animal kingdoms, with particular emphasis on those organisms which have a direct effect on man; the flowering plants; ecology and conservation; the various human systems, with emphasis on physiology rather than anatomy; contributions of medicine; genetics and evolution.

82.603, 82.604   Man in Society   Prep. 82.601, 82.602; 6 hrs.
Management must get things done through people. This necessitates a clearer understanding of psychological and sociological factors and forces which influence man's actions. The student studies himself as an individual, as a member of groups, as a potential leader, as a parent, and as a young person beginning a career in management. Class discussions develop ability to link principle with current affairs; ranging from the student's personal life to the broad problems of people living in groups. A sensitivity to and awareness of human needs and values is developed which assist the student in learning how to live a more effective life as a member in a complex society.

82.605, 82.606   Man's Cultural Inheritance   Prep. 82.603, 82.604; 6 hrs.
As Americans, a rich heritage has come to us from many areas and civilizations, a weaving together of the many things from which our culture has evolved. History and political science furnish the background for democracy in the Greek city-states. Paintings, sculpture and achitecture from many lands and eras provide aesthetic appreciation for our time and society. Music and literature interpret the passions and emotions of mankind. Illustrated lectures and recordings plus a field trip to the Boston Art Museum make the student aware of music, painting, sculpture, architecture, and literature that go to make up man's cultural inheritance.

82.607, 82.608   Man and Values   Prep. 82.605, 82.606; 6 hrs.
Each man must determine his own philosophy of life. He must live his own
life in a universe which he did not create in conflict with obstacles against
which he has no control. The student considers truth, good, evil, ethics,
logic and the practical implications of the major schools of philosophical
thought. Also, generic, moral, religious, cognitive, aesthetic and social
values; meaning and direction in nature and history; and the function and
benefits of philosophical thinking for the examined life.

84 — Real Estate

84.601   Real Estate Fundamentals   2 hrs.
Real estate's place in our social economy; the operation and forces of the
market and its relation to over-all public interest; land economics and devel-
opment, the market, building and its problems, building construction,
brokerage, starting a real estate business, mortgage lending, remodeling, in-
surance, planning and zoning, government legislation — V.A. Loan Guaranty
and Federal Housing Administration insurance on G.I. and non-G.I. loans.

84.602   Real Estate Law   Prep. 84.601; 2 hrs.
Legal processes and instruments used in controlling real estate ownership
and transactions involving the acquisition, use, enjoyment and disposition
of real estate and including land titles, estates, contracts, agreements of sale,
deeds, mortgages and foreclosures, easements, liens, leases, landlord and
tenant relations and liabilities, purchase and sale of real estate, conveyancing,
wills and probate, building and zoning laws, and insurance.

84.603   Real Estate Investment   Prep. 41.629, 84.602; 2 hrs.
Advantages and risks of investment in real estate, types of real estate invest-
ments, the workings of the real estate operator with regard to exchange of
real estate and speculation, financing of real estate purchase and develop-
ment, the relation of investor to manager and broker, real estate manage-
ment as a business, the organization of a management department in a
brokerage firm, management policies, rent and rental problems, the funda-
mentals of apartment house management and co-operative apartments.

84.604   Real Estate Management   Prep. 84.601; 2 hrs.
Real estate management as a business, the organization of a management
department in a brokerage firm, management policies, management and
co-operative apartments.

84.605   Real Estate Finance   Prep. 84.602; 2 hrs.
Current methods of financing real estate, banking systems, instruments of
finance, population trends, long term leases, appraising, financing various
types of real estate, effect of taxes (income and other) on real estate, the
role of government in this field, functions of brokers.

84.606   Real Estate Sales and Operations   Prep. 84.601; 2 hrs.
Local markets and current transactions; securing and evaluating listings; a
broker's obligation to clients; market information sources; preparation for
showing property; obtaining and classifying prospects; methods employed
in showing and closing; real estate agreements, financing and closings; trad-
ing and exchanging; economics and techniques of advertising, publicity and
public relations.

84.607   Residential Real Estate   Prep. 84.601; 2 hrs.
Residential land, single and multiple homes and sales of subdivisions, including model home techniques.

84.608   Commercial Properties   Prep. 84.601; 2 hrs.
Apartment buildings, store and office buildings, shopping centers, hotels, motels, leasebacks, special purpose properties and land management.

84.609   Industrial Properties   Prep. 84.601; 2 hrs.
Heavy and light manufacturing properties, warehouse and waterfront property, theatres, garages, gasoline stations and storage plants.

84.610   Real Estate Appraisal   Prep. 84.601; 2 hrs.
The basic knowledge and tools necessary to appraise residential, commercial and industrial properties. Study is made of valuation concepts, the purposes of appraisal; the sources, collection, and application of data used to prepare appraisals; the use of tables; residual techniques; special purpose properties, the summation and final estimate of value, and the writing of appraisal reports.

84.611   Real Estate Market Research   Prep. 84.601; 2 hrs.
The economics of real estate, supply and demand, psychological and human side, business cycles, money supply, economics in mortgage lending, population trends and governmental influences on the economics of real estate.

85 — Traffic Management

85.601   Traffic Management I   2 hrs.
Evaluation of the various available transportation services including movement of freight by rail, motor, water, and air carriers, freight forwarders, parcel post and express as well as combinations and modifications of each; bills of lading and other documents; freight classification and rules; rates; routing and consolidation; analysis of carriers' special services, including transit privileges, and also their terminal services.

85.602   Traffic Management II   Prep. 85.601; 2 hrs.
Application of principles of transportation and management to industrial activity. Study of tariff circular requirements and tariff and rate formulation; claims procedure and prevention; regulation and regulatory procedure. Management of private transportation; warehousing; material handling and containerization; site selection; export and import phases of traffic management.

85.603   Advanced Traffic Management Problems   Prep. 85.602; 2 hrs.
Case problems. Diagnosis of the specific ills of transportation companies and industrial traffic departments is stressed. Appropriate remedies are formulated. A management viewpoint which interrelates the traffic department with other departments is developed by coordinated consideration of services, prices, costs, regulations, and other functions. A traffic survey is made, and policies are established.

85.604   Ocean Transportation   2 hrs.
Principles and practices of transporting freight by water. Common, contract and tramp carrier operations; methods of calculating and applying rates and charges; cargo control — containerization and palletization; customs

procedures and documentation; free zones; through movement from and to inland points; port authority operation and development; legal aspects of this mode.

85.605   Air Cargo Transportation   2 hrs.
The chronological development and scope of the industry: air freight, air express and airmail. Characteristics of aircraft as cargo carriers; acceptability of cargo; practical applications of tariffs; competitive position; legal factors; contribution of air transportation to the development of our economy.

85.606, 85.607   I.C.C. Practice and Procedure   Prep. 85.601; 4 hrs.
Regulation of transportation by Federal and State governments; execution of these responsibilities and detailed procedures. History and content of Interstate Commerce Act; impact upon industrial activity. Purpose of practitioners examination; study of cases pertinent to Constitution's Commerce Clause. Administrative law and procedure; ethics and general rules of practice.

85.608   Motor Carrier Operations   2 hrs.
Mission and characteristics of the industry. Types of carriers — common, contract, private, local, over-the-road. Regulation under the Act of 1935. Internal organization and administration. Terminal and operating management; selection, financing, maintenance and replacement of equipment. Industrial relations; safety and insurance; taxation and cost allocation. Sales; public relations and rate conferences.

85.609   Freight Claims   Prep. 85.602; 2 hrs.
Practical procedure and legal basis for handling loss and damage claims. The bill of lading as a contract; development of common carrier liability. Duties of consignee and carrier on accepting damaged freight. Preparation, filing and prosecution of freight claims. Statute of limitations and concealed damage.

85.610, 85.611   Rates, Tariffs and Pricing   Prep. 85.607: 4 hrs.
Analysis of the tools and techniques of rate making and pricing. Use and construction of tariffs; exploration of rate structures; practical rate and tariff problems. Economic ramifications of transportation pricing. Procedures before rate making conferences. Leading decisions of I.C.C. and Federal courts in pricing matters.

85.612   Distribution and Warehousing   2 hrs.
Study of materials storage as an integrated element in the transportation of freight; procedures for reduction of distribution costs; improvement of service through more precise selection of facilities. Functions of different types of warehouses; use of warehouse receipts for short-term financing; storage as a natural economic method to stabilize prices and control markets.

85.613, 85.614   Transportation Economics   4 hrs.
Theory for managerial decisions and for the mechanics of traffic management; role of transportation in producing and marketing of goods; transportation and the division of labor; effect of freight rates on commodity prices and the location of industry; philosophy of public utility regulation, rates and service.

85.615   Urban Transportation   2 hrs.

An analysis of the relationships between highway and public transportation and other economic activities; distribution and growth of population and land utilization in urban areas; definition and application of comprehensive planning with reference to possible future Federal grants. The Mass. Transportation Commission's studies of the Greater Boston region will be used as a point of departure in the discussion.

85.616   Railroad Transportation   2 hrs.

Delineation of the railroad problem of today based on a study of shifts in freight and passenger traffic. Effect of rail revenues and profits on the national economy; public promotion of transport facilities and the results fashioned by regulatory agencies; relative efficiency and distinguishing characteristics of the principal modes; railroad pricing under current regulation; cooperation and future joint planning between railroad management and agencies of government.

86 — Law Enforcement and Security

86.601   Administration of Justice   2 hrs.

A survey of the evolution of justice from earliest times, developed historically, with particular emphasis on western justice and American justice including the roles played by the judiciary, federal law enforcement agencies, state police and investigative organizations, county agencies, and municipal departments.

86.602   Law Enforcement Administration and Management   2 hrs.

The fundamental principles of police organization, administration, and management, including staff and line functions, chain of command, span of control, selection of personnel, and promotional systems.

86.603, 86.604   Police Interrogation   4 hrs.

The various techniques of police interrogation with concentration on questioning suspects, witnesses, victims, informants, and complaints. The laws governing interrogation practices are reviewed as well as the psychology of interrogation and the use of the lie detector as an investigative aid. Mock cases are used so that all class members have an opportunity to interrogate under simulated conditions.

86.605, 86.606   Criminal Investigation and Case Preparation   4 hrs.

The fundamentals of criminal investigation including crime scene procedure, crime scene search, collection and preservation of evidence, recording the crime scene, police photography, some of the more basic principles of forensic science, surveillance and the development of informants. Methods of preparing the case for court are studied thoroughly and completely.

86.607, 86.608   Police Patrol   4 hrs.

A comprehensive study of all types of uniformed police patrol including foot, vehicular, water, and air patrol stressing the basic assumptions of and rationale for each type including considerations for deployment of personnel, beat layout, mechanics of arrest, riot control, raids, road blocks, stopping methods, and transportation of prisoners.

86.609 Criminal Law   2 hrs.
The history of criminal law; its development in America; constitutional considerations; elements of a crime; statutory make-up; elements of various crimes; the law of arrest; entrapment; criminal responsibility; defenses; and procedures in the court room.

86.610 Evidence   2 hrs.
Rules of evidence; principles of exclusion; evaluation and examination of evidence and proof; competency; consideration of witnesses; laws of search and seizure.

86.611, 86.612 Traffic Law Enforcement   4 hrs.
The enforcement of law as it relates to traffic; accident prevention and investigation; driver testing and licensing; safety education; traffic surveys; selective enforcement; traffic engineering; administration of traffic divisions; reporting; records; prosecuting; the traffic court; training.

86.613 Records in Law Enforcement   2 hrs.
A study of the various types of law enforcement record systems, including consideration of the utilization of forms, electronic systems, record analysis, and specialized control through the use of records.

86.614 Criminal Identification   2 hrs.
A thorough presentation of the available means of identifying criminals including consideration of fingerprinting, portrait parle, Bertillonage, observation and description, photography, handwriting, typewriter identification, and identification of skeletal remains with stress on the practical application of identification principles in modern police work.

86.615 Introduction to Criminalistics   2 hrs.
The elements of microscopy, comparative microscopy, spectroscopy and chemistry as they are used in the study of firearms, hair, fibers, blood, paint, tools, glass, documents, laundry marks, poisons and other organic and inorganic materials which comprise physical evidence. This course is intended only as a survey course in Criminalistics.

86.616 Police Juvenile Methods   2 hrs.
The role of the juvenile officer as well as the role of the police officer without juvenile responsibility in crime prevention, with emphasis on theory, administration, control, treatment, confinement, community resources, relations with the public, and the juvenile court.

**86.617 Special Problems in Law Enforcement Administration
and Management**   2 hrs.
Police control methods from the administrative standpoint and including consideration of special problems in regard to narcotic traffic, sex deviates, minorities, strikes, natural and atomic disasters, juvenile crimes, vice control, and community relations.

86.618 Investigative Report Writing   2 hrs.
Designed to instruct the law enforcement officer in determining report content as a result of interpreting and evaluating information. Particular emphasis is placed on collection of information, accurate description, analysis

of information and concise writing. The student is required to participate in numerous report writing projects, all of which are designed specifically to meet his everyday needs in the investigative field.

86.619   Police Supervision   2 hrs.
A comprehensive consideration of command-level problems as these relate to supervision, including planning and research, training, discipline, examinations, promotions, rating systems, auxiliary units, organization; budgetary considerations, deployment of personnel, line and staff distinctions, policy formulations, high-level administrative responsibility, interdepartmental relations, problem handling, personnel policies, supervisory relationships at all ranks, wages, grievances, morale, and safety.

86.620, 86.621   Police Public and Community Relations   4 hrs.
The principles of sound public and community relations applied to the entire police operation. Consideration is given to public speaking, press releases, press relations, police-public contact, police-minority group relations, intergroup relations, and human relations.

86.622   Police Research Methods   2 hrs.
An opportunity for each student to conduct a research project which must be related to a specific police interest or operation. The student chooses his research project in consultation with his faculty advisor. The course meets at the discretion of the instructor. The student may consult with his advisor concerning his project at any time. A project paper showing the results of research is required.

86.623, 86.624   Government Security Programs   4 hrs.
Concentration of Department of Defense security programs, including applicable federal statutes and executive orders as well as general requirements in the processing of security clearances and classified information; the control of closed and restricted areas and classified and unclassified visits; supervision of programs relating to sub-contractors, vendors and suppliers, automatic time-phased downgrading and declassification, and the protection of proprietary information.

86.625, 86.626   Plant Protection   4 hrs.
The organization, administration, and management of plant protection operations including special technical and legal problems in industrial facilities of all types; the management of private guard forces; police liaison; the use of electronic and mechanical prevention devices; selection of personnel; public relations; plant parking and traffic control; records; prevention programs; training; screening employees; rules and regulations; special functions; deployment of personnel; wages; unions; and equipment.

86.627   Industrial Fire Prevention   2 hrs.
The organization, administration, and management of a fire prevention program within business and industry; the use of a fire brigade; specialized training; employee incentives; sprinkler systems; equipment; construction techniques, employee relations; rules and regulations and their enforcement; plant location; inspections; fire department liaison; and special hazards.

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Index

130

Northeastern University

COLLEGES OPERATING ON THE CO-OPERATIVE PLAN

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Offers full-time day curricula in science and non-science fields leading to the degree of Bachelor of Arts.

Affiliated Programs:

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For dental hygienists — Offers curricula, in affiliation with the Forsyth School for Dental Hygienists, leading to the degree of Associate in Science.

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Offers full-time day curricula on the Co-operative Plan leading to the degrees of Bachelor of Science in Physical Education and Bachelor of Science in Physical Therapy.

For further information
regarding any of the above colleges, address

Dr. Gilbert C. Garland, Dean and Director of Admissions
NORTHEASTERN UNIVERSITY
360 Huntington Avenue, Boston, Massachusetts 02115
Tel. 262-1100

Northeastern University

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Education — Offers late afternoon, evening, and Saturday morning programs leading to the degree of Master of Education.

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Pharmaceutical Sciences — Offers programs leading to the Master of Science degree with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

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The New England Police Institute, in co-operation with the New England Association of Chiefs of Police and the Massachusetts Chiefs of Police Association, conducts special short-term, non-degree programs and seminars.

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NORTHEASTERN UNIVERSITY
360 Huntington Avenue, Boston, Massachusetts 02115
Tel. 262-1100

NORTHEASTERN UNIVERSITY

LINCOLN COLLEGE

PROGRAMS IN ENGINEERING TECHNOLOGY

EVENING SESSIONS

1964-1965 BULLETIN

NORTHEASTERN UNIVERSITY

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BOSTON MASSACHUSETTS

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SEPTEMBER 3, 1963 — JUNE 13, 1964

Monday — Friday ....8:30 A.M.-8:30 P.M.
Saturdays .... 8:45 A.M.-12:00 Noon

JUNE 15, 1964 — AUGUST 27, 1964

Monday — Thursday .... 8:30 A.M.-8:30 P.M.
Friday .... 8:30 A.M.-4:30 P.M.

AUGUST 31, 1964 — JUNE 19, 1965

Monday — Friday ....8:30 A.M.-8:30 P.M.
Saturdays ....8:45 A.M.-12:00 Noon

INTERVIEWS

Prospective students, or those desiring advice or guidance regarding any part of the school work or curricula, are encouraged to arrange for personal interviews with the Dean or other officers of instruction. Career planning through competent guidance provides an understanding of professional requirements and develops that definiteness of purpose so vital to success.

Address communications to

DEAN DONALD H. MacKENZIE
LINCOLN COLLEGE
NORTHEASTERN UNIVERSITY
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone 262-1100

NORTHEASTERN UNIVERSITY

Lincoln College
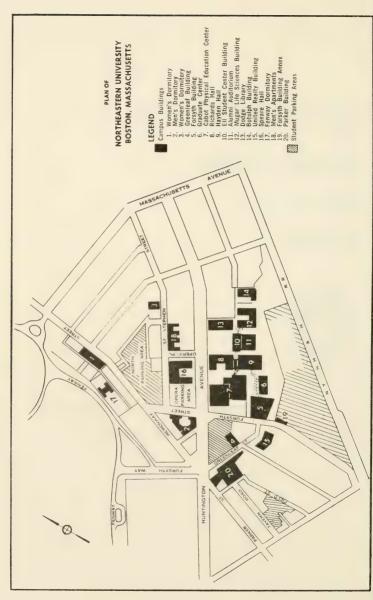
BULLETIN

1964-1965

*Evening Courses of College Grade
in Engineering Technology*

BOSTON, MASSACHUSETTS

PLAN OF
NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS

LEGEND

■ Campus Buildings

1. Women's Dormitory
2. Men's Dormitory
3. Women's Dormitory
4. Greenleaf Building
5. Forsyth Building
6. Graduate Center
7. Cabot Physical Education Center
8. Richards Hall
9. Hayden Hall
10. Ell Student Center Building
11. Alumni Auditorium
12. Mugar Life Sciences Building
13. Dodge Library
14. Botolph Building
15. United Realty Building
16. Speare Hall
17. Fenway Dormitory
18. Men's Apartments
19. Forsyth Building Annex
20. Parker Building

▨ Student Parking Areas

MASSACHUSETTS AVENUE

ST. STEPHEN STREET

FENWAY

HEMENWAY STREET

NORTH PARKING AREA

OPERA PARKING AREA

OPERA PL.

FORSYTH STREET

FORSYTH WAY

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PARKER ST.

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TABLE OF CONTENTS

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CALENDAR

1964

Summer session classes begin	*May*	25
Legal Holiday — No class sessions	*May*	30
Commencement	*June*	14
Legal Holiday — No class sessions	*July*	4
Summer session classes end	*August*	27
Fall semester classes begin	*September*	21
Legal Holiday — No class sessions	*October*	12
Legal Holiday — No class sessions	*November*	11
Legal Holiday — No class sessions	*November*	26
Final class session before Christmas recess . .	*December*	21

1965

First class session after Christmas recess . . .	*January*	4
Final examinations, fall semester	*January*	18-28
Division B and second semester classes begin . .	*February*	1
Legal Holiday — No class sessions	*February*	22
Legal Holiday — No class sessions	*April*	19
Make-up session for Monday classes — Saturday .	*May*	1
Final examinations, spring semester	*May*	18-24
Legal Holiday — No class sessions	*May*	30
Summer session classes begin	*June*	1

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10

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11

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Donald H. MacKenzie, B.S., Ed.M. *Dean*

George A. Mallion, B.Ch.E. *Assistant Dean*

Administrative Committee

Donald H. MacKenzie, *Chairman*

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Howard W. Evirs, Jr.

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Doris L. Warren, *Secretary — Records*

Judith A. Bauld, *Clerk-Typist*

Carole A. Pierce, *Clerk-Typist*

Ruth A. Emerson, *Clerk-Typist*

Aims and Scope of the University

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of more than one hundred and twenty-five distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Co-operative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), and Nursing (1964). This time-tested educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, actuarial science, and the pharmaceutical sciences.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. These programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day but who are desirous of broadening their educational background by part-time study. All formal courses of study leading to degrees through evening programs are approved by the appropriate Basic College faculties and are subject to the same quantitative and qualitative standards as the regular day curricula.

The following is a brief outline of the aims and scope of the University's programs.

I. THE EIGHT COLLEGES

1. The College of Liberal Arts

The College of Liberal Arts offers majors in the usual fields of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Co-operative Plan.

2. The College of Education

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Co-operative Plan, which provides for employment in libraries, social service agencies, and school systems.

3. The College of Business Administration

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development which annually conducts an intensive program designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Co-operative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate co-operative students as research assistants.

4. The College of Engineering

The College of Engineering offers five-year co-operative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power

systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day co-operative curriculum, and meets the same qualitative and quantitative standards of scholarship.

5. The College of Pharmacy

The College of Pharmacy offers five-year co-operative curricula leading to the degree of Bachelor of Science in Pharmacy. Co-operative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

6. The College of Nursing

The College of Nursing offers a three-year program on the Co-operative Plan which qualifies students for the associate degree and prepares them for the R.N. Examinations. Three of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, and the Massachusetts General Hospital — collaborate with Northeastern University by providing suitable co-operative work opportunities during the second and third years of the program. Graduates of the three-year program may continue toward the Bachelor of Science degree if they so desire.

7. University College

University College, so called because it draws upon the resources of the other Colleges of the University, offers courses of study leading to certificates, associate degrees, or to the Bachelor of Science degree. University College offers both day and evening programs; the latter are designed specifically to meet the needs of older, more mature students who wish to undertake part-time curricula during late afternoon or evening hours and on Saturday mornings. In co-operation with the Forsyth School for Dental Hygienists, University College also offers a two-year day curriculum leading to the Associate in Science degree.

Quality standards of instruction and requirements for the degrees offered by University College are wholly consistent with those of the other Colleges of the University. University College does not duplicate the offerings of the Colleges of Liberal Arts, Business Administration, Pharmacy, Education, Engineering, and Nursing, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adults desiring formal programs of professional development on a part-time basis, or of young people enrolled in professional schools affiliated with Northeastern University.

8. Lincoln College

Lincoln College offers four-year evening programs of study in several fields of science and engineering technology leading to the degree of Associate in Science or Associate in Engineering. The courses of study are of

college grade and cover much of the technological subject matter customarily included in schools of engineering, but the curricula are less extensive in scope than those required for the baccalaureate degree in engineering. They prepare students to work with professional engineers in various technical capacities.

II. THE GRADUATE DIVISION

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

Arts and Sciences

Master of Arts, Master of Science, Ph.D. in Physics and in Chemistry

Business

Master of Business Administration

Education

Master of Education

Engineering

Master of Science with course specification, Ph.D. in the fields of Electrical and Chemical Engineering

Actuarial Science

Master of Science in Actuarial Science

Pharmaceutical Sciences

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology

Some of these programs are offered on the Co-operative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in the Graduate Center Building.

III. CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. Through the Bureau of Business and Industrial Training, the Center provides in-service programs, custom-built to meet specific needs of business and industrial enterprises, while the Division of Special Programs working co-operatively with trade associations, and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

IV. AFFILIATED PROGRAMS

1. For Dental Hygienists

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in co-operation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

2. For Medical Technologists

In co-operation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time program on the Co-operative Plan leading to the degree of Bachelor of Arts.

3. For Nurses

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the Peter Bent Brigham, New England Deaconess, and Children's Hospital Medical Center Schools of Nursing.

V. RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are co-ordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction in the areas of art and sciences, business, engineering, pharmacy, nursing, and teacher education, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

Buildings
and
Facilities

Northeastern University is located on Huntington Avenue in the Back Bay section of Boston. The main administrative offices of the University are located in Richards Hall.

The chief railroad centers of Boston are the North and South stations. To reach the University from the North Station, board an MTA subway car going to Park Street and transfer there to any Huntington Avenue car. To reach the University from South Station, board a Cambridge-bound subway train and transfer at Park Street to a Huntington Avenue car. The "Northeastern" station is the first stop outside the subway.

HUNTINGTON AVENUE CAMPUS

The principal educational buildings of Northeastern University are located on sixteen acres of a 42-acre site in the Back Bay section of Boston. Only one block to the west of the University lie the famous Boston Museum of Fine Arts and the beautiful public gardens-park reservation known as "The Fenway." A map of the Huntington Avenue Campus appears on page 2.

Following a long-range development plan, University facilities have expanded substantially in recent years. In addition to seven new buildings, all constructed within the past 25 years, several modernized older buildings are available for specialized uses. The newer buildings are interconnected by means of tunnels.

In addition to classrooms and instructional offices, the principal buildings include the following:

BOTOLPH BUILDING — Department of Civil Engineering

CABOT PHYSICAL EDUCATION CENTER — Gymnasium, Cage, Rifle Range

DODGE LIBRARY — Library, Engineering Drawing Rooms

ELL STUDENT CENTER — Student Activities, Chapel, Auditorium, University Commons

FORSYTH BUILDING — Department of Industrial Engineering, Mechanical Engineering Laboratories, Health Service

GRADUATE CENTER — Administrative Offices of the Graduate Division, Department of Natural Sciences, Physics Laboratories, Cafeteria

GREENLEAF BUILDING — ROTC Headquarters, Research Facilities

HAYDEN HALL — Offices of University College, Center for Continuing Education, Lincoln College, College of Business Administration, College of Education; Department of Electrical Engineering; Department of Art

MUGAR LIFE SCIENCES BUILDING — College of Pharmacy and College of Nursing; Departments of Psychology, Biology, and Chemical Engineering

RICHARDS HALL — Administrative Offices, Chemistry and Mechanical Engineering Laboratories, Bookstore

SUBURBAN CAMPUS AT BURLINGTON — In order to meet the needs of individuals and of industry in the area, Northeastern University has established a Suburban Campus near the junction of Routes 128 and 3 in Burlington, Massachusetts.

In addition to graduate courses in engineering, physics, mathematics, business, science, education, and the arts, portions of undergraduate programs leading to the Associate and Bachelor of Science degrees, special programs for women and non-credit state-of-the-arts programs in the form of seminars, conferences, institutes, forums, and "released-time" programs are offered.

General
Information

STUDENT BODY

The STUDENTS of the Lincoln College represent men and women of earnest purpose and firm endeavor who bring to bear on their work a thoroughness which promises future success. Their ages range from seventeen to fifty-two, the average age being twenty-six years. Almost all the students are engaged in work during the day and many different occupations have their representatives in the student body, a fact which demonstrates that the College can be of service to men in many walks of life. Some students are preparing to enter engineering work; many are already engaged in engineering work and are studying to prepare themselves for increased responsibility and rewards.

LIBRARY AND STUDY AREAS

The UNIVERSITY LIBRARY is well equipped in technical literature and is available for use of students of the College. The reading rooms are open from 8:00 A.M. to 10:00 P.M. Monday through Thursday, from 8:00 A.M. to 7:30 P.M. on Friday, and from 8:30 A.M. to 4:00 P.M. on Saturday. In addition, the Richardson Reading Room is open until 11:00 P.M. Monday through Thursday and until 10:00 P.M. on Friday. This room is also open on Sunday from 1:00 until 5:00 P.M. The privilege of obtaining books from the Boston Public Library is extended to students of the College. Application for this privilege, which involves a fee, should be made directly to the Boston Public Library.

Adequate study areas are available in the Library and Ell Student Center Building for student use.

TEXTBOOKS AND SUPPLIES

The UNIVERSITY BOOKSTORE is operated for the convenience of the student body. All books and supplies which are required by the students for their work in the College may be purchased at the Bookstore, which is located on the ground floor of Richards Hall.

PLACEMENT SERVICE

It is the policy of the College to serve the students whenever possible by placing them in those positions which promise attractive opportunities for development and advancement. The College cannot guarantee to place its students, but it does endeavor to keep in close touch with those who desire placement service and to assist them in obtaining satisfactory advancements in positions and income. No charge is made for placement service. Those needing this assistance should arrange an appointment with the Director of Placement.

VISITORS

Visitors are always welcome at one class session in any department. Those who wish to visit any of the classes should call at the school office and obtain a visitor's card signed by the Dean.

PARKING FACILITIES

With recent land acquisitions Northeastern University now has approximately 1,500 parking spaces available exclusively for students. These parking areas are shown on the map on page 2.

Requirements for Admission

REGULAR STUDENTS

Applicants for admission who present evidence of completion of an approved secondary school course, or the equivalent of fifteen units (including one unit in Algebra and one in Plane Geometry), may be admitted as regular students, candidates for the Degree of Associate in Engineering or Associate in Science and also eligible to proceed later, if they so desire, to the Degree of Bachelor of Science offered by University College of Northeastern University.

CONDITIONED STUDENTS

Applicants for admission who do not meet the full requirements for admission as regular students may, at the discretion of the Committee on Admission, be admitted as conditioned students provided such secondary school work as has been completed embraces one unit of Algebra and one unit of Plane Geometry.

A conditioned student whose scholarship is satisfactory but who has not removed his conditions within the time specified by the Committee on Admission may be permitted to continue with his program of studies, but on the completion of the chosen four-year curriculum he will receive a diploma indicating the completion of the program, but not carrying the award of the Degree of Associate in Engineering or Associate in Science.

SPECIAL STUDENTS

Students who wish to register for a special program or for single courses may be admitted as special students, not candidates for the Degree, provided their previous education and training are the equivalent of the prerequisite requirements for the courses in which they wish to enroll.

Programs are planned to meet individual needs and should prove of benefit to those who wish rapid and immediate knowledge of certain fields, whether to supplement former training or to obtain preparation which will permit them to enter a new line of endeavor.

Classification of Students

Students are admitted to Lincoln College in September, January or June. Applicants admitted without entrance deficiencies may complete the requirements for the Associate Degree in four academic years by attending three evenings per week.

All applicants admitted to the freshman class as degree candidates are required to take the Mathematics Placement Test which is given on the following dates:

May 18, 1964 — for June *(Summer Term)* students

September 14, 1964 — for September *(Division A)* students

January 25, 1965 — for January *(Division B)* students

Those who demonstrate satisfactory proficiency in the test will proceed directly with the prescribed courses for the first year.

Inasmuch as success in the study of engineering is based upon a proficiency in Mathematics, those who receive a low score in the Placement Test (either because of inadequate preparatory courses or because of the length of time elapsed since graduation from secondary school) are classified as "Pre-Engineering Students" and must enroll for and satisfactorily complete a special comprehensive one-term course in Pre-Engineering Mathematics. Upon satisfactory completion of this course they are reclassified as degree candidates.

DIVISION A STUDENTS

Students starting in September who demonstrate satisfactory proficiency in the Mathematics Placement Test may, by attendance on three evenings per week, complete the prescribed courses for the freshman year in May. They may, however, elect a lighter scholastic load, thereby extending their programs of study.

Summer courses are not necessary for Division A students carrying the normal course load. However, those enrolled as candidates for the degree of Bachelor of Science may find it advantageous to complete certain of their management courses during the summer terms.

DIVISION B STUDENTS

Students starting in January and demonstrating satisfactory achievement in the Mathematics Placement Test may complete two of the three freshman year courses by attending three evenings per week from January to the middle of July.

PRE-ENGINEERING STUDENTS

Students who demonstrate in the Mathematics Placement Test a need for review in Mathematics are classified as Pre-Engineering Students and must enroll for the course Pre-Engineering Mathematics. This course, consisting of Algebra and Plane Geometry, is available in each of the three terms starting in September, January or June.

During the Fall and Spring Terms the course meets two evenings a week from 6:50-9:30 P.M. In the Summer Term it meets three evenings a week for the first six weeks and two evenings a week for the next eight weeks.

Students enrolling for Pre-Engineering Mathematics in September may also concurrently enroll in the course Engineering Drawing. Satisfactory completion of Pre-Engineering Mathematics would then permit them to enroll in January for the regular Engineering Mathematics course. By taking Physics in the Summer Term they would then be ready to start the Sophomore year in September. However, attendance during the summer is not obligatory.

Students enrolled for Pre-Engineering Mathematics in the January and Summer Terms can complete but this one course. This, however, will qualify them to continue in September as degree candidates in the full freshman program.

Administrative Regulations

APPLICATIONS FOR ADMISSION

Applications for admission should be filed as early as possible in order that the necessary investigations may be made and the status of each student definitely determined before the opening day.

STUDENTS ADMITTED WITH ADVANCED STANDING

Advanced Standing Credit may be granted for work completed in other approved colleges or institutions provided the courses taken were equivalent to those offered by the Lincoln College. It will be necessary for the applicant to obtain an official transcript of record together with a catalogue and present them to the Dean before any action can be taken. This should be done no later than one week before the opening of the semester.

REGISTRATION

Each student is required to present himself at the school office, and to have his course approved by the Dean or his assistants and to complete his registration.

Students should avoid late registrations since no one is permitted to join a class after the second session. *No deduction from tuition fees is made because of late enrollment.*

THE SCHOOL YEAR

The school year is divided into two semesters of sixteen weeks each. The first semester extends from September 21, 1964 to January 28, 1965 and the second semester from February 1, 1965 to May 27, 1965. The summer term extends from June 1, 1965 to August 26, 1965.

During the summer term Pre-Engineering Mathematics, Algebra, Trigonometry, Engineering Drawing I and II, Physics I and II, are the only courses offered.

SESSIONS

Classes meet on weekday evenings. There are no classes regularly scheduled on Saturdays. A full schedule will include three evenings a week. All classes meet from 6:50 to 9:30 P.M.

ATTENDANCE REQUIREMENTS

Class rolls close after the second session. Therefore, a student must attend either the first or second class session to be eligible for admission to a course.

A careful record of attendance upon class exercises is kept for each

student. Absence from regularly scheduled classes on any subject will seriously affect the standing of the student.

A minimum attendance record of 75 per cent must be maintained in each class before a student will be admitted to examination. Students will be dropped from the class roll when their absences exceed 25 per cent of the class sessions. A student dropped for this reason *cannot be reinstated* and *no refund of tuition* will be granted.

Students who are unavoidably absent from class may receive the homework assignments by telephoning the school office.

TESTS AND QUIZZES

Final examinations are required upon the completion of all courses. Tests are held throughout the term at the discretion of the instructors.

A student absent from a regularly scheduled test may petition for a make-up test. This is a privilege which may be denied if abused by an excessive number of petitions or other reason.

The following procedure must be observed: —

1. Obtain a petition from the College office.

2. Complete it in detail and pay the required fee of $3.00 to the Bursar's office.

3. Original petition form must then be filed in the College office and student's copy countersigned.

Make-up tests will be given on a Saturday at 1:30 P.M. in a designated room.

Petitions must be filed in accordance with the schedule listed below. Following is a list of petition and make-up dates for the school year 1964-1965.

For Test Missed in	Must File Petition by	Must Take Test on
Sept. or Oct.	12:00 NOON, Saturday, Nov. 7	November 21
November	12:00 NOON, Saturday, Dec. 5	December 19
December	8:30 P.M., Thursday, Jan. 7	January 16
February	12:00 NOON, Saturday, Mar. 6	March 20
March	12:00 NOON, Saturday, Apr. 10	April 24
April or May	12:00 NOON, Saturday, May 8	May 15

In the event that an absence is known in advance, a petition may be filed before the quiz is missed. *No petition will be accepted after the dates specified for ANY reason.*

Any student who does not take the make-up test as scheduled will lose this make-up privilege.

TRANSFERS

Students are not permitted to change from one course to another without first consulting the Dean and receiving a Transfer Order signed by him.

GRADING SYSTEM

The following system of grading is used:

A — Superior Work

B — Above Average Work

C — Average Work

D — Lowest Passing Grade

Inc — Incomplete (Given only when final examination is missed)

F — Failure

A grade of "F" is a definite failure and the student must repeat the course in its entirety. No special examination will be allowed.

MAKE-UP EXAMINATIONS

The following policies govern make-up of final examinations:

If a student is absent from a final examination, he will receive a grade of "Inc." He may then petition before a specified date for a special make-up final examination. This is a privilege which may be granted by the Committee on Education and is dependent upon the quality of the work the student has done throughout the course. If granted, the examination must be taken prior to the next final examination period and in accordance with instructions from the office. Failure to remove the "Inc" will result in it being changed to an "F" at the end of the next semester.

The fee for each make-up examination is $5.00.

QUALITY POINTS

To figure quality points each course grade is given a numerical value as follows:

$$A = 4 \qquad C = 2 \qquad F = 0$$
$$B = 3 \qquad D = 1 \qquad Inc = 0$$

If a course meets two evenings per week, the point value will be doubled. The total number of quality points divided by the total number of course nights completed shall be the quality point average.

A student must achieve a quality point average of 1.75 to graduate from the College.

REPORTS OF STANDING

A report of the student's standing is issued at the end of each semester. Grades are mailed to the students and will not be given out at the school office. Under no circumstances will grades be given over the telephone. In the case of students who are under twenty-one years of age, reports may be sent to parents in the event of unsatisfactory work on the part of the student, non-compliance with administrative regulations, continued absence, and withdrawal. Parents of minors may obtain reports at any time on request.

GRADUATION REQUIREMENTS

Students may register for single subjects or for complete courses provided such registration meets with the approval of the Dean; but to receive the Degree of Associate in Engineering or Associate in Science, the student must fulfill the following conditions:

a. He must complete all the courses of his particular curriculum, either by attendance at this College, or by receiving advanced standing credit for those courses, or the equivalent of those courses, as determined by the Dean.

b. The various curricula have been arranged so that the courses can be completed in four years. An extension of time will be granted to those who wish to take longer to meet the requirements for graduation; however, the entire program normally must be completed in eight years from date of entrance into Lincoln College.

c. Regardless of the advanced standing credit he receives, he must have been in attendance for at least a year preceding the date on which he expects to graduate; that is, he must complete at least one full year's work in the Lincoln College.

d. He must have achieved a quality point average of at least 1.75 in the courses taken in the College. Courses for which a student has been awarded Advanced Standing Credit will not be counted in determining a student's scholastic average.

e. Upon graduation, honors will be conferred based upon the following quality point averages:
3.0 — Honor   3.5 — High Honor   3.75 — Highest Honor
In order to be eligible for honor graduation, a student must have completed at least two full years of work in the Lincoln College.

ATTENDANCE AT COMMENCEMENT

All candidates for a first degree (bachelor or associate) are required to attend Commencement in the year of qualification. First degrees in absentia are awarded only to candidates excused for personal or immediate-family illness, military service, or employment obligations beyond the control of the candidate.

A petition to receive a degree in absentia must be presented to the dean of the school or college in which the candidate qualifies. Each petition will be acted upon by the academic dean involved.

ACADEMIC STANDARDS

It is expected that the students will at all times endeavor to achieve a high record of attainment. The Committee on Education reserves the right to review all students' records and deny readmission to those students who fall below a minimum quality requirement. This requirement has been established as follows:

In order to be allowed to remain in the College, a student must have achieved a quality point average of 1.2 at the completion of 18 semester hours, 1.4 at the completion of 36 semester hours, and 1.6 at the completion of 54 semester hours. It should be further noted that a student who accumulates the equivalent of 6 failures ("F" or "Inc" not cleared) may be considered ineligible to continue in the College.

METHODS OF INSTRUCTION

Instruction is given by means of lectures, recitations, laboratory work and practical work in the drawing rooms. Great value is set upon the educational effect of these exercises, which constitute the foundation of each of the courses. Oral and written examinations are held at the discretion of the instructors.

The attention of every student is drawn to the fact that home assignments must be dutifully done and written work submitted as assigned if the student's grade is not to be seriously affected. Willful disregard of this matter will result in disciplinary action by the Administrative Officers.

SUBJECTS OF INSTRUCTION

On pages 50 to 65 will be found a detailed statement of the scope of the subjects offered in the various courses. The subjects are numbered for convenience of reference in consulting the various curriculum schedules.

Required courses, and those prerequisite thereto, must have been successfully pursued before any advanced course may be taken.

Tuition and Other Fees

MATRICULATION FEE

A matriculation fee of $10.00 must accompany the initial application for admission to the College. This fee is not refundable.

TUITION

Tuition fees are based on the following schedule:

	Huntington Ave. Campus	Suburban Campus	Control Systems Eng. (Hunt. Ave.)
Sem. Hr. charge	$ 17.50	$ 20.00	$ 30.00
1 night (3 sh.)	52.50	60.00	2 sh. 60.00
2 nights (6 sh.)	105.00	120.00	4 sh. 120.00
3 nights (9 sh.)	157.50	180.00	not available
Pre Eng. Math.	105.00	120.00	

Tuition is charged on a semester basis payable at the beginning of each semester. As a convenience to students, at their request and without additional charge, the Student Accounts Office will allow this bill to be paid in two payments.

LATE PAYMENT FEE

Payments are due by Saturday of the week in which the bill is dated. If payment is not made, or a deferred payment agreement arranged, by that date, a late fee of $2.00 is charged.

DEFERRED PAYMENT PRIVILEGE

Occasionally situations develop — usually beyond the control of the student — which make it difficult to meet the payments in the manner outlined above. Under such circumstances the student is advised to discuss his problem personally with the Student Accounts Office where a convenient deferred payment agreement can be worked out. A service fee of $2.00 is charged for this privilege.

LATE REGISTRATION FEE

Students are urged to register well in advance of the official opening of the semester, since any student who registers after Saturday of the opening week of the School term is charged a Late Registration Fee of $5.00.

CHEMISTRY FEE

All students taking a Chemistry Laboratory course are charged a laboratory deposit, payable at the beginning of each semester as follows:

	1st Sem.	2nd Sem.
General Chemistry Laboratory	$10	$10
Qualitative Analysis Laboratory	$10	—
Quantitative Analysis Laboratory	—	$15
Organic Chemistry Laboratory	$15	$15

Upon completion of a laboratory course or withdrawal during the semester, the student must check out his locker with the stock room attendant. Failure to do this will result in an additional charge of $4.00.

The unused portion of the deposit will be refunded after deductions are made for breakages, chemicals, supplies and non-returnables.

SPECIAL EXAMINATION FEES

The fee for each special examination for students who have for justifiable cause omitted to take the regular scheduled final examinations, is $5.00. The fee must be paid when the petition is filed in the Lincoln College office.

The fee for each special test or quiz missed during the month is $3.00 which must be paid when the petition is filed in the Lincoln College office.

GRADUATION FEE

On completing the curricular requirements for the Degree of Associate in Engineering or Science, the student will pay a graduation fee of $20.00 This fee must be paid by May 1 in the year of the student's graduation.

BOOKS AND SUPPLIES

Students purchase their own textbooks and work materials. The cost varies according to the subject for which the student is enrolled. The average cost for a normal program of three subjects is about $25.00. Textbooks for a single course range from $4.00 to $15.00.

Students taking Engineering Drawing should be prepared to expend a sum of approximately $18.00 for drawing supplies and $22.00 for a set of drawing instruments in addition to the textbooks which cost approximately $9.50.

REFUND OF TUITION

The University provides all instruction and accommodations on an academic semester basis; therefore, no refunds are granted except in cases where students are compelled to withdraw on account of personal illness or other reasons beyond their control. In no event will a refund be made if the individual's attendance is recorded beyond the fifth class session. A student must complete an official withdrawal application before being considered for refund. Questions regarding refunds should be discussed with the Bursar's Office.

Programs
of Instruction

Lincoln College offers evening programs of study leading to the degree of Associate in Engineering in the major fields of Mechanical, Electrical, Bio-Electronic, Electronic Sanitary, and Structural Engineering Technology, Surveying Technology, and the degree of Associate in Science in the field of Chemistry.

In addition the College offers special courses in Nuclear Technology and an advanced program in Control Systems Engineering Technology for which a certificate is awarded.

The courses of study are of college grade and cover much of the technological subject matter customarily included in schools of engineering but the curricula are less extensive in scope than those required for the baccalaureate degree in engineering. They prepare students to work with professional engineers in various technical capacities.

Students normally attend on a schedule of three evenings a week for four years. In those cases where students are unable to carry all of the work prescribed in any year, the Dean will grant an extension and determine the order in which courses shall be taken to satisfy prerequisite requirements.

Graduates of Lincoln College who have been awarded the Associate Degree are granted sixty semester hours credit as satisfying the technological requirements for the Bachelor of Science Degree offered by University College of Northeastern University.

CHEMISTRY

Leading to the Degree of Associate in Science

The Science of Chemistry has undergone a marked development in recent years. It has grown out of the discoveries of the chemical laboratories which have launched many new industries whose production processes involve chemical as well as physical change. The chemist is in demand and his aid is sought in the operation of plants producing drugs, oils, rayon and cellophane, plastics and various synthetic products resulting from intensive research during the war. The chemist may assist in the creation of more economical manufacturing processes, promote the development of manufacturing by-products, and be instrumental in the discovery of new products in the research laboratories.

In addition to the fundamental courses in chemistry, mathematics, and physics, a considerable amount of time is devoted to more advanced work in chemistry. Since the field is so varied, the curriculum has been designed to give students a broad training rather than a specialized training in one specific industry.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Pre-Engineering Mathematics Course. (700)

FIRST YEAR

First Semester			Second Semester		
Course No.	Course	Semester Hours	Course No.	Course	Semester Hours
701	Algebra	3	702	Trigonometry	3
601	Engineering Drawing I	3	602	Engineering Drawing II	3
725	Physics I	3	726	Physics II	3
		9			9

SECOND YEAR

703	Analytical Geometry and Differential Calculus	3	704	Integral Calculus	3
101	General Chemistry I	3	102	General Chemistry II	3
151	General Chem. Lab. I	3	152	General Chem. Lab.	3
		9			9

THIRD YEAR

103	Qualitative Chemistry	3	104	Quantitative Chemistry	3
153	Qualitative Analysis Laboratory	3	154	Quantitative Analysis Laboratory	3
**	Engineering Elective	3	**	Engineering Elective	3
		9			9

FOURTH YEAR

107	Physical Chemistry I	3	108	Physical Chemistry II	3
105	Organic Chemistry I	3	106	Organic Chemistry II	3
155	Organic Chem. Lab. I	3	156	Organic Chem. Lab. II	3
		9			9

**The electives available are Applied Mechanics I & II, Dc-Ac Circuit Theory, Nuclear Technology I & II.

ELECTRICAL ENGINEERING TECHNOLOGY

Leading to the Degree of Associate in Engineering

The electrical engineering profession affords a wide diversification of employment opportunities. The electrical industry and the general field of electrical engineering are generally divided into two main branches, one having to do with electrical power and the other, electronics and communications. The power group deals principally with larger equipment and apparatus employing heavy currents; the communications group involves more delicate equipment with smaller current values. Electrical engineering thus includes the generation, transmission and distribution of electrical energy for light and power purposes, the application of d-c and a-c machinery to industry, and the operation of all types of electrical equipment, including communications, radio and electronic apparatus.

This course of study provides a good theoretical background with practical applications highly concentrated in the power field. Instruction is carefully planned and the time is divded among lecture, laboratory testing, homework and reports.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Pre-Engineering Mathematics Course. (700)

FIRST YEAR

First Semester			Second Semester		
Course No.	Course	Semester Hours	Course No.	Course	Semester Hours
701	Algebra	3	702	Trigonometry	3
601	Engineering Drawing I	3	602	Engineering Drawing II	3
725	Physics I	3	726	Physics II	3
		9			9

SECOND YEAR

703	Analytical Geometry and Differential Calculus	3	704	Integral Calculus	3
301	D-c Circuit Theory	3	302	A-c Circuit Theory	3
501	Applied Mechanics I	3	502	Applied Mechanics II	3
		9			9

THIRD YEAR

303	D-c Machinery	3	304	A-c Machinery	3
353	D-c Machinery Lab.	3	354	A-c Machinery Lab.	3
503	Strength of Materials I	3	504	Strength of Materials II	3
		9			9

FOURTH YEAR

355	Electronics for Industry Lab. I	3	356	Electronics for Industry Lab. II	3
305	Electronics for Industry	3	306	Transmission-Line Theory	3
505	Heat Engineering I	3	307	Computer Programming	3
		9			9

BIO-ELECTRONIC ENGINEERING TECHNOLOGY

Leading to the Degree of Associate in Engineering

Since the introduction of brain-wave apparatus in medical research about twenty years ago, there has been a steady increase in the use of electronic techniques into other areas of medical diagnosis. Today, many areas in hospitals look like electronic laboratories. This wide use of electronic techniques and equipment in the medical field has raised the need for electronic engineers who have a knowledge of the human system.

The curriculum outlined here has been designed to serve this need. The final topics in a course of this type must lean heavily on a good background in chemistry. A knowledge of the digestive, nervous, circulatory, and muscle systems, as well as the various organs in the human body, must also be studied.

The study of electronic devices includes a sufficient amount of laboratory to be able to handle the special instruments found in the medical field.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Pre-Engineering Mathematics Course. (700)

FIRST YEAR

First Semester			Second Semester		
Course No.	Course	Semester Hours	Course No.	Course	Semester Hours
701	Algebra	3	702	Trigonometry	3
601	Engineering Drawing I	3	602	Engineering Drawing II	3
725	Physics I	3	726	Physics II	3
		9			9

SECOND YEAR

703	Analytical Geometry and Differential Calculus	3	704	Integral Calculus	3
301	D-c Circuit Theory	3	302	A-c Circuit Theory	3
101	General Chemistry I	3	102	General Chemistry II	3
		9			9

THIRD YEAR

**405	Electron Tubes & Circuits I	6	**406	Electron Tubes & Circuits II	6
105	Organic Chemistry I	3	106	Organic Chemistry II	3
		9			9

FOURTH YEAR

107	Physical Chemistry I	3	108	Physical Chemistry II	3
121	Bio-Chemistry	3	140	Animal Psysiology	3
411	Bio-Electrical Measurements	3	460	Bio-Electronic Laboratory	3
		9			9

**Two nights per week.

ELECTRONIC ENGINEERING TECHNOLOGY

Leading to the Degree of Associate in Engineering

This course is designed to train students for the various branches of the field of Electronics. The new advancements in the fields of computers, space exploration, military and air navigation systems have opened up greater opportunities for intellectual pioneering in these fields of engineering than in other branches of the profession

Since electronic devices, basically, function around the principles of Electricity, this subject is adequately treated in the second year of the course. After a thorough study of the various types of electron tubes, transistors and their basic circuits in the third year, the fourth year is devoted to the various specialized subjects that the student will need to know, such as Communications, Microwaves and Pulse Circuits.

The whole course is a good balance between theory and practice, and experiments involving electron tubes, transistors and their applications are used through the last three semesters of the course. Laboratory reports and homework problems are used to supplement the experiments and lectures so that the student will absorb the material in a thorough manner.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Pre-Engineering Mathematics Course. (700)

FIRST YEAR

First Semester			Second Semester		
Course No.	Course	Semester Hours	Course No.	Course	Semester Hours
701	Algebra	3	702	Trigonometry	3
601	Engineering Drawing I	3	602	Engineering Drawing II	3
725	Physics I	3	726	Physics II	3
		9			9

SECOND YEAR

703	Analytical Geometry and Differential Calculus	3	704	Integral Calculus	3
301	D-c Circuit Theory	3	302	A-c Circuit Theory	3
401	Wave Propagation	3	402	Semiconductors and Transistors	3
		9			9

THIRD YEAR

**405	Electron Tubes and Circuits I	6	**406	Electronic Tubes and Circuits II	6
403	Electrical Measurements	3	456	Electronic Lab.	3
		9			9

FOURTH YEAR

**407	Communication Engineering I	6	**408	Communication Engineering II	6
457	Advanced Electronic Lab. I	3	458	Advanced Electronic Lab. II	3
		9			9

**Two nights per week.

MECHANICAL ENGINEERING TECHNOLOGY

Leading to the Degree of Associate in Engineering

The field of mechanical engineering is concerned with the harnessing of our power resources by means of machinery to perform useful work. In contrast to civil engineering which deals primarily with static forces, mechanical engineering is more concerned with the mechanics of motion or kinetics. And because moving parts require constant care and adjustment, there is the task not only of designing and installing complicated machinery, but also of operating it efficiently after it has been installed.

Among the major branches of mechanical engineering are included power, production engineering, machine and machine-tool design, railway mechanical engineering, automotive engineering, aeronautical engineering, refrigerating engineering, air conditioning engineering, and the numerous mechanical problems related to modern industrial operation.

This program of study is designed to give the student considerable training in the principles of mechanical engineering technology and equip him for advancement in the many sub-divisions of this branch of engineering.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Pre-Engineering Mathematics Course. (700)

FIRST YEAR

First Semester			Second Semester		
Course No.	Course	Semester Hours	Course No.	Course	Semester Hours
701	Algebra	3	702	Trigonometry	3
601	Engineering Drawing I	3	602	Engineering Drawing II	3
725	Physics I	3	726	Physics II	3
		9			9

SECOND YEAR

703	Analytical Geometry and Differential Calculus	3	704	Integral Calculus	3
603	Machine Drawing I	3	604	Machine Drawing II	3
501	Applied Mechanics I	3	502	Applied Mechanics II	3
		9			9

THIRD YEAR

507	Mechanism	3	204	Hydraulics	3
503	Strength of Materials I	3	504	Strength of Materials II	3
505	Heat Engineering I	3	506	Heat Engineering II	3
		9			9

FOURTH YEAR

509	Machine Design I	3	510	Machine Design II	3
551	Mechanical Engineering Laboratory I	3	552	Mechanical Engineering Laboratory II	3
**	Engineering Elective	3	**	Engineering Elective	3
		9			9

**The electives are Concrete Design I & II, Dc-Ac Circuit Theory, General Chemistry Lecture I & II, Nuclear Technology I & II, Structural Analysis I & II, Structural Drawing, Structural Design I, Surveying I & II.

SANITARY ENGINEERING TECHNOLOGY

Leading to the Degree of Associate in Engineering

The field of Civil Engineering has to do with the planning and building of all kinds of structures and public works. Today its major branches include topographical, municipal, railroad, highway, structural, hydraulic, and sanitary engineering. It covers land surveying, the building of railroads, soil mechanics, harbors, docks, the construction of sewers, water works, streets and highways, the design and construction of flood control projects, bridges, buildings, walls, foundations, and all fixed structures.

This curriculum is designed to offer the relatively compact body of principles upon which much of the work of Sanitary Engineering depends. It is intended to prepare young men to assist in solving the problems of water supply and sewerage systems and to undertake intelligently the work of plant operation and the supervision of work in allied fields of engineering and contracting.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Pre-Engineering Mathematics Course. (700)

FIRST YEAR

First Semester		Semester Hours	Second Semester		Semester Hours
Course No.	Course		Course No.	Course	
701	Algebra	3	702	Trigonometry	3
601	Engineering Drawing I	3	602	Engineering Drawing II	3
725	Physics I	3	726	Physics II	3
		9			9

SECOND YEAR

703	Analytical Geometry and Differential Calculus	3	704	Integral Calculus	3
201	Surveying I	3	202	Surveying II	3
501	Applied Mechanics I	3	502	Applied Mechanics II	3
		9			9

THIRD YEAR

203	Transportation Engineering	3	204	Hydraulics	3
503	Strength of Materials I	3	504	Strength of Materials II	3
101	General Chemistry I	3	102	General Chemistry II	3
		9			9

FOURTH YEAR

207	Concrete Design I	3	208	Concrete Design II	3
205	Structural Analysis I	3	206	Structural Analysis II	3
211	Water Supply	3	212	Sewerage and Sewage Disposal	3
		9			9

STRUCTURAL ENGINEERING TECHNOLOGY

Leading to the Degree of Associate in Engineering

The field of Civil Engineering has to do with the planning and building of all kinds of structures and public works. Today its major branches include topographical, municipal, railroad, highway, structural, hydraulic, and sanitary engineering. It covers land surveying, the building of railroads, soil mechanics, harbors, docks, the construction of sewers, water works, streets and highways, the design and construction of flood control projects, bridges, buildings, walls, foundations, and all fixed structures.

This curriculum is designed to offer the relatively compact body of principles upon which much of the work of Structural Engineering depends. It is intended to prepare young men to assist in the work of design and construction of structures and to undertake intelligently the supervision of work in allied fields of engineering and general contracting.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Pre-Engineering Mathematics Course. (700)

FIRST YEAR

First Semester			Second Semester		
Course No.	Course	Semester Hours	Course No.	Course	Semester Hours
701	Algebra	3	702	Trigonometry	3
601	Engineering Drawing I	3	602	Engineering Drawing II	3
725	Physics I	3	726	Physics II	3
		9			9

SECOND YEAR

703	Analytical Geometry and Differential Calculus	3	704	Integral Calculus	3
201	Surveying I	3	202	Surveying II	3
501	Applied Mechanics I	3	502	Applied Mechanics II	3
		9			9

THIRD YEAR

203	Transportation Engineering	3	204	Hydraulics	3
503	Strength of Materials I	3	504	Strength of Materials II	3
215	Structural Drawing	3	216	Structural Design I	3
		9			9

FOURTH YEAR

207	Concrete Design I	3	208	Concrete Design II	3
205	Structural Analysis I	3	206	Structural Analysis II	3
217	Structural Design II	3	218	Structural Design III	3
		9			9

SURVEYING TECHNOLOGY

Leading to the Degree of Associate in Engineering

The field of Surveying, although primarily of importance to the Civil Engineer, is also of considerable importance in other branches of engineering as mining, agricultural, electrical, mechanical, and chemical. All engineering and construction projects are based upon elaborate and complete surveys. Projects such as highways, power transmission lines, pipe lines, sewers, buildings, industrial plants, wharfs, piers, dams, reservoirs, aqueducts, etc. are dependent upon the surveyor for accurate data necessary for design and construction.

This curriculum is designed to offer a background of surveying techniques such as to enable a young man to perform the necessary preliminary and final surveys and calculations required for both small projects such as subdivision work, individual lot layouts, highway layouts as well as more complicated surveys such as are usually required for large industrial layouts or engineering projects such as aqueducts, reservoirs and large bridges.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Pre-Engineering Mathematics Course. (700)

FIRST YEAR

Course No.	First Semester Course	Semester Hours	Course No.	Second Semester Course	Semester Hours
701	Algebra	3	702	Trigonometry	3
601	Engineering Drawing I	3	602	Engineering Drawing II	3
725	Physics I	3	726	Physics II	3
		9			9

SECOND YEAR

Course No.	Course	Semester Hours	Course No.	Course	Semester Hours
703	Analytical Geometry and Differential Calculus	3	704	Integral Calculus	3
201	Surveying I	3	202	Surveying II	3
501	Applied Mechanics I	3	502	Applied Mechanics II	3
		9			9

THIRD YEAR

Course No.	Course	Semester Hours	Course No.	Course	Semester Hours
251	Survey, Field and Office Practice I	3	252	Survey, Field and Office Practice II	3
221	Surveying III (Geodesy)	3	222	Surveying IV (Photogrammetry)	3
503	Strength of Materials I	3	204	Hydraulics	3
		9			9

FOURTH YEAR

Course No.	Course	Semester Hours	Course No.	Course	Semester Hours
211	Water Supply	3	212	Sewerage and Sewage Disposal	3
223	Legal and Professional Aspects of Surveying	3	224	Foundations and Structures	3
225	Computers	3	203	Transportation Engineering	3
		9			9

CONTROL SYSTEMS ENGINEERING TECHNOLOGY

Leading to a Certificate

This is a special sequence of courses designed for the recent graduates of technical institutes who are seeking to advance professionally by taking courses which are geared specifically to the age of automation. They are also designed for the engineer who received his bachelor's degree several years ago and wishes to keep up with current technological changes.

Applicants for admission must have at least an Associate Degree in Electrical or Electronic Engineering Technology or a Bachelor Degree in Engineering.

A certificate will be awarded upon satisfactory completion of sixteen semester hours of credit.

REQUIRED COURSES

	First Semester			Second Semester	
Course No.	Course	Semester Hours	Course No.	Course	Semester Hours
927	Transients in Linear Systems I	2	928	Transients in Linear Systems II	2

BASIC COURSES

(may be taken concurrently with 927, 928)

943	Advanced Mathematics I	2	944	Advanced Mathematics II	2
945	Electric Circuit Theory I	2	946	Electric Circuit Theory II	2

ELECTIVE COURSES

(require completion of 927, 928 as pre-requisite)

931	Pulse Circuits I	2	932	Pulse Circuits II	2
933	Transistor Circuit Eng. I	2	934	Transistor Circuit Eng. II	2
935	Servomechanisms I	2	936	Servomechanisms II	2
937	Analog & Digital Computers I	2	938	Analog & Digital Computers II	2

Tuition is charged at the rate of $30.00 per semester hour.

Students may not register for more than 2 subjects per semester.

The Dean of University College will accept up to ten (10) semester hours for Engineering Technology credit for work completed in this advanced program. This is in addition to credit awarded for an Associate Degree in Engineering.

INDUSTRIAL TECHNOLOGY
Leading to the Degree of Bachelor of Science

The Industrial Technology curriculum combines fundamental courses in one of several areas of engineering with an integrated program in management, the humanities and the social sciences to provide background for those who aspire to positions of managerial responsibility where technical knowledge is required.

The curriculum is offered by University College in conjunction with Lincoln College, one of the schools of Northeastern University. Graduates of Lincoln College or other technical schools who have been awarded the Associate Degree are granted sixty hours credit toward the Bachelor of Science Degree. The technology requirements may also be earned by satisfactory completion of equivalent technology courses in an accredited engineering college.

The total requirements for the degree are 130 semester hours distributed as follows;

		Semester Hours
Engineering Technology Courses		60
Management Courses Required		36
English and Business Communications	4	
Managerial Accounting	4	
Economic Principles and Problems	4	
Money and Banking	2	
Financial Organization and Management	2	
Introduction to Management	2	
Industrial Management	4	
Principles of Marketing	4	
Labor Management Relations	2	
Quality Control Statistics	4	
Law for Engineers	4	
Liberal Content — Required		24
LA1-2 Man and His Physical Universe	6	
LA3-4 Man in Society	6	
LA4-5 Man's Cultural Inheritance	6	
LA6-7 Man and Values	6	
Management Courses — Electives		10
Total semester hours required for degree		130

Courses for elective credit may be selected from the course offerings of University College, provided requirements have been met. University College will also award 10 semester hours elective credit for courses taken in the Control Systems Engineering Technology Program, offered through Lincoln College.

INDUSTRIAL ENGINEERING TECHNOLOGY

Students who are interested in pursuing a program in Industrial Engineering Technology should enroll for the Associate Degree in Mechanical Engineering Technology.

Upon completion of this program they should then enroll in University College for the Industrial Technology program.

Satisfactory completion of these two phases will allow a student to qualify for the Degree of Bachelor of Science.

SUPPLEMENTARY COURSES IN NUCLEAR TECHNOLOGY

These courses are offered as elective fourth year subjects for Mechanical Engineering Technology students or as supplementary courses for graduates of any of the curricula of Lincoln College or similar schools.

The courses are designed to introduce the student to that branch of engineering directly concerned with the release, control, and utilization of nuclear energy. Through these courses the student will become acquainted with the terminology of the field and with the health and safety factors involved.

Laboratories

The Lincoln College has available for its use all of the laboratory facilities of the College of Engineering. These include the following:

CIVIL ENGINEERING LABORATORIES

A considerable amount of demonstration equipment including many models is available for use in the study of structures, hydraulics, sanitary engineering, highway, concrete and soil mechanics.

Surveying

The Department of Civil Engineering is provided with a variety of excellent and up-to-date equipment for field work. The instruments have been chosen to make possible the working out of advanced as well as elementary field problems, and to acquaint the students with the principal makes and types of instruments in general use including several calculating machines and a Geodimeter.

Hydraulics, Sanitary, and Bacteriological Engineering

These laboratories, located on the basement and first floors of the Botolph Building, are equipped with demonstration measuring devices for use in connection with the courses in hydraulics.

Complete equipment is also provided for studies of water softening, filtration, coagulation, analysis of water and sewage by the photelometer, and analysis of bacterial condition of water and sewage. Specialized equipment for advanced courses in sanitary research is also available.

Highway Materials
(Cement, Concrete, Soils, and Asphalt)

Located on the first floor of the Botolph Building, this modern, temperature-humidity-controlled laboratory is equipped for conducting all the routine tests on cement, aggregate and concrete. Considerable equipment is available for conducting research work.

Equipment is also available for conducting a major portion of the accepted tests on bituminous materials and aggregates as used in highway

work as well as Marshall Stability Unit for bituminous concrete. Soil Mechanics equipment consists of a general soil sampler, wet-mechanical grain-size analysis, Tri-axial Test equipment, Permeability, OMC unit, CBR equipment, two Tri-axial units and four Consolidation loading frames, and a Hydraulic Consolidometer.

Aerial Photogrammetry

The apparatus in this laboratory may be used to instruct the students in the basic principles of photogrammetry, or may be used to instruct the students in the more technical phases of photogrammetry such as horizontal control, vertical control, stereoscopic plotting, mechanical triangulation, and the tre-metrogon method of plotting.

CHEMICAL LABORATORIES

For experiments and investigations in Chemistry there are available three laboratories with the following equipment:

Analytical Chemistry

The laboratory for Analytical Chemistry is fully equipped for giving instruction in the usual undergraduate courses. Each student is supplied with the necessary laboratory glassware, porcelain, and the standard pieces of hardware. Special equipment of all needed types is available.

This laboratory is equipped with high pressure steam, vacuum, and the facilities usually found in an analytical laboratory. The various instruments and other chemical equipment necessary for the examination, testing, and analysis of the raw materials, intermediate and final products of the various industries are at hand.

An adjoining balance room is equipped with Mettler single pan balances suitable for quantitative analytical work.

Inorganic Chemistry

In the locker assigned to each student for his individual use are the articles needed more or less continually by him as he does his experiments in the laboratory sessions. He has a liberal supply of glass, porcelain, metal and other articles. Additional pieces of apparatus are issued from the stockroom or otherwise made available for use in particular experiments where they are needed.

The laboratories are equipped with general facilities appropriate to this course, such as gas, electricity, cold and hot water, fume hoods.

Organic Chemistry

The needed equipment is available. There are individual lockers and apparatus, fume hoods for general use, and special equipment, as required.

Drying operations are carried out with the aid of a steam-heated drying chamber and electrically heated drying oven. Steam lines on the benches supply the steam for steam distillations, eliminating the necessity of individual steam generators.

NUCLEAR ENGINEERING LABORATORY

The major pieces of equipment in the Nuclear Engineering Laboratory are the subcritical training reactor, nuclear reactor simulator and power plant simulator.

The subcritical training reactor consists of 5500 lbs. of natural uranium fuel contained in approximately 300 aluminum tubes. The moderator surrounding the tubes is ordinary light water. The reactor is activated by a 5 curie plutonium-beryllium neutron source. Located next to the reactor is measuring and recording equipment used for experiments.

The nuclear reactor simulator is a special purpose analog computer which is capable of reproducing the performance of existing research reactors. The console is similar to the console of a real reactor and contains the same controls and recorders.

The power plant simulator is a general purpose analog computer designed to operate in conjunction with the reactor simulator. This combination is capable of simulating the operation of a nuclear power plant. Effects of load on steam temperature and various heat transfer studies may be made with this unit.

The laboratory is also equipped with conventional nuclear equipment for detecting and measuring radiation.

ELECTRICAL ENGINEERING LABORATORIES

The Electrical Engineering laboratories are located in Hayden Hall. Three laboratory areas are included in this unit; Dynamo; Industrial Electronics and Control; and Communications Laboratories.

Dynamo

This laboratory is provided with both 60 cycle per second three-phase, 230-volt alternating-current and 115/230-volt three-wire direct-current sources. The equipment includes a number of motors and generators of different types together with the necessary auxiliary equipment to operate and test them. The motors and generators have been selected so as to reduce as much as possible the risk from high voltage while making available to the students a representative range of commercial apparatus.

Industrial Electronics and Control Laboratory

This laboratory is designed to offer experiments in the application of electronic tubes and circuits to industry. In addition to basic electronic-control circuits, there are pieces of equipment, including the control of d-c generator voltage, d-c motor speed control, polyphase rectifiers, as well as servomechanism devices and systems.

Communications Laboratory

This laboratory is equipped with apparatus to demonstrate and test the many ramifications of electronic equipment used in low, audio, radio-frequency and high-frequency circuits. Available are many electronic instruments, including vacuum-tube voltmeters, cathode-ray oscilloscopes, audio

and radio-frequency oscillators, wave-analyzers, pulse-generators and equipment operating at radar frequencies, as well as many other types used in telephone, radio, and television communication circuits; included also is equipment planned for teaching the principles of electrical measurements and calibrations.

ELECTRONIC ENGINEERING LABORATORIES

The Electronics laboratories are located in Hayden Hall.

Electron Devices

Equipment is available to study the operation of most types of electron tubes that are normally used, extending from vacuum diodes through to gas tetrodes; and in the semiconductor field there are crystal diodes, transistors and silicon controlled rectifiers, and the various rectifier, amplifier and other basic circuits used with them, including vacuum tube voltmeters, impedance bridge, regulated power supplies, resistance coupled amplifiers, inverse feedback amplifiers, wide band oscilloscopes, and audio generators.

Communication Engineering

Equipment available for this course includes crystal oscillators, audio and radio oscillators, voltage and power radio frequency amplifiers, frequency doublers, plate and grid modulation units, single side band generators, direct-coupled amplifiers, push-pull audio amplifiers, video amplifiers, O-meters, intermodulation meter and harmonic distortion meters. The frequency modulation apparatus includes balanced modulators, reactance modulators, phase modulators, discriminators, panoramic adapters, limiters, and networks. The RCA dynamic demonstrator, plus detector, and IF amplifier units are used for receiver experiments.

Apparatus for pulse circuitry includes sweep oscillators and amplifiers, pulse and square wave generators, video amplifiers, pulse forming and delay lines, multivibrators, counters, clipping, shaping, and logic circuits. New equipment includes the latest wave analyzers, triggered sweep oscilloscopes, and polaroid oscilloscope camera. The RCA dynamic demonstrator is used for complete TV receiver studies. Apparatus for klystroms, wave guides, slotted lines, frequency counters, parametric amplifiers, and analog computers is also available. Transistors are used in circuits where suitable.

To keep up with the expanding field of Electronics, both equipment and experiments are added and modified each year.

MECHANICAL ENGINEERING LABORATORIES

The Mechanical Engineering Department has a well-equipped laboratory, containing a large variety of modern machines and occupying over 10,000 square feet of floor space in the basement of Richards Hall, as well as about the same area in the basement of the Forsyth Building. Special areas have been set aside and equipped for oil testing, vibration testing,

experimental stress analysis and similar purposes. Auxiliary equipment is, of course, available for making all the usual tests and measurements.

Steam Power

This equipment includes a variety of steam engines, turbines, pumps, heat exchangers, and measuring instruments.

Testing Materials and Heat Treatment

For tension, compression, bending, and shearing tests, the laboratory is equipped with a 300,000 lb. capacity Riehle, a 200,000 lb. and a 50,000 lb. capacity Olsen and a 60,000 lb. capacity Young testing machine as well as several smaller machines. For other tests the laboratory has torsional testing machines, impact testers, fatigue testers, hardness testers, extensometers, oil testing equipment, calorimeters, as well as instruments for measuring speed, vibration, temperatures, pressures and flow of fluids.

For heat treatment studies, electric furnaces, vacuum furnace and a gas-fired furnace are available. Equipment magnifying up to 2600 diameters is available for photographing crystalline structures, and the laboratory has polaroid equipment for photoelastic stress analysis.

X-ray equipment is available for examining metals.

Machine Shop

Adjoining the laboratory is a machine shop fully equipped with machine tools and welding equipment.

Internal Combustion, Aeronautics, and Miscellaneous

The internal combustion equipment includes a number of gas and oil, automobile, airplane, and Diesel engines. Most of these are set up for running experimental tests, but several are available for dismantling and demonstration purposes.

An open circuit Venturi type wind tunnel having a three-foot throat and capable of 120 miles per hour wind velocity is available for experimental and demonstration work in the measurement of air forces on model planes and other structures.

In addition to the above equipment, there is an oil-fired steam boiler, unit heater, air conditioning units, centrifugal fan and several weirs for measuring water flow.

Metallography tests with microscopes and photographic apparatus may be performed.

A Rover gas turbine has recently been installed for testing purposes.

DESIGN AND DRAFTING ROOMS

The School possesses large, light, and well-equipped drawing rooms for the carrying on of the designing and drafting which form so important a part of engineering work. These rooms are supplied with individual drawing tables and stools.

PHYSICS DEPARTMENT

Two large amphitheater lecture rooms, located in the Graduate Center Building, are provided with motion picture facilities, closed circuit TV apparatus, a public address system, a projection galvanometer, and a demonstration table equipped with water, compressed air, exhaust and both a-c and d-c electrical outlets.

The equipment which is used for illustrating the fundamental principles of physics has been carefully selected and adapted especially for lecture demonstrations. The following is a partial list of the available apparatus that supplements the usual equipment for this purpose: Hartl optical disk; eight-foot slide rule; vacuum pumps; calorimeters; optical benches with associated equipment; large demonstration cathode-ray oscilloscope; overhead projection apparatus; Van de Graaff electrostatic generator; sound and wave apparatus.

THE COMPUTATION CENTER

This laboratory consists of an IBM 1620-II digital computer and associated data processing equipment. It is used in certain courses from time to time for demonstration of computing procedures. It is the laboratory for all courses given in the areas of computer programming and data processing.

Description of Courses

THE LINCOLN COLLEGE reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

The Lincoln College further reserves the right to change the requirements for graduation, tuition and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time pursuant to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

Chemistry

101   General Chemistry I

Instruction in the fundamental ideas of matter and energy; properties of gases; liquids, and solids; molecular and atomic weights; theory of valence; classification of the elements; chemistry of metals and non-metals; the solution of all types of problems to illustrate practical applications.

(Prerequisite, 701, 702, 725, 726)   *3 semester hours credit*

102   General Chemistry II

Ionic reactions; electrochemistry; introduction to organic chemistry including industrial applications to petroleum rubber, synthetic resins, plastics; chemotherapy; introduction to qualitative analysis.

(Prerequisite, 101)   *3 semester hours credit*

103   Qualitative Chemistry

Instruction in analytical procedure and technique; application of fundamental concepts of solutions to laboratory work; formulation of numerical terms essential to understanding mass action law, ionic equilibria; solubility product, hydrolysis, and redox constants.

(Prerequisite, 101, 102)   *3 semester hours credit*

104   Quantitative Chemistry

Gives student a realization of scientific development of quantitative methods. Weighing, measurement of volumes, titration, filtration, ignition, and combustion are considered from standpoint of theoretical principles involved and manipulative technique necessary. Combination of these operations and their application to actual analysis, comprehensive study of volumetric methods and more elementary parts of gravimetric analysis. Problems introduced to emphasize correct calculation of analytical results as well as procedures.

(Prerequisite, 103)   *3 semester hours credit*

105   Organic Chemistry I

General principles of structure, nomenclature, preparation, uses and reactions of the most important types of aliphatic carbon compounds. Petroleum and coal products, halogen compounds, alcohols, ethers, aldehydes and ketones, carboxylic acids and derivatives, and carbohydrates.

(Prerequisite, 101, 102)   *3 semester hours credit*

106   Organic Chemistry II

Aromatic hydrocarbons, phenols, halogen derivatives, nitrogen compounds, dyes, sulfur compounds, polyfunctional compounds, stereoisomerism, natural and synthetic polymers, alicyclic and heterocyclic compounds.

(Prerequisite, 105)   *3 semester hours credit*

107   Physical Chemistry I

Fundamentals of physical chemistry. The three states of matter, the solution laws, surface phenomena and colloids, thermochemistry, and chemical equilibrium.

(Prerequisite, 104, 704)   *3 semester hours credit*

108   Physical Chemistry II

Ionic equilibrium, electrochemical cells and electrolysis, kinetics of chemical reactions, atomic and molecular structure, and radioactivity. Practical applications of these fundamentals are discussed whenever possible.

(Prerequisite, 107)   *3 semester hours credit*

121 Biochemistry

Chemistry of metabolism, electrolytic equilibrium, elementary reaction mechanisms, catalysis; enzymes, and the metabolism of carbohydrates, proteins, fats, and nucleic acids are included as major topics.

(Prerequisite, 105, 106)   *3 semester hours credit*

140 Animal Physiology

Properties of living protoplasm, the general organization and function of cells, translocation of materials and the organization of animals. The physiology of the skeletal systems of man and animals; the physiology of amoeboid, ciliary and contractile movement with emphasis on muscle metabolism. The structure and function of neurons, reflex arcs, the autonomic nervous system and the sensory receptors. Fluid media of animals, emphasizing water and electrolyte balance and kidney function in many; the physiology of blood, including its formation, functions, clotting, antigens and tests for identifying blood. The physiology of the heart, nervous control of the vascular system, breathing and gas transport, heat regulation, nutrition, digestion and assimilation; a survey of the endocrine secretions and the physiologic aspects of reproduction.

3 semester hours credit

151 GENERAL CHEMISTRY LABORATORY I

A series of laboratory experiments operated in conformance with the lecture course in General Chemistry I.

(Prerequisite, 101 or concurrently)

3 semester hours credit

152 GENERAL CHEMISTRY LABORATORY II

A series of laboratory experiments operated in conformance with the lecture course in General Chemistry II.

(Prerequisite, 151, 102 or concurrently)

3 semester hours credit

153 Qualitative Analysis Laboratory

Applies the material covered in Qualitative Chemistry to actual problems. After some preliminary experiments, certain procedures are combined and the separations and identifications made on both known and unknown solutions. Finally, these are combined into a comprehensive system of analysis which is applied to artificially prepared mixtures and industrial materials. Careful manipulations, thoroughness in observation, and accuracy in arriving at conclusions are expected of each student.

(Prerequisite, 151, 152, 103 or concurrently)   *3 semester hours credit*

154 Quantitative Analysis Laboratory

Illustrates by actual use the various analytical methods considered in Quantitative Chemistry. After certain preliminary experiments designed to acquaint the student with the apparatus used, volumetric analysis, includ-

ing acidimetry and alkalimetry, oxidation, reduction, and precipitation methods are taken up. This is followed by simple gravimetric analyses.

(Prerequisite, 153, 104 or concurrently)   *3 semester hours credit*

155   Organic Chemistry Laboratory I

Co-ordinated with the lecture course, Organic Chemistry I, and deals with the preparation and reactions of the aliphatic compounds.

(Prerequisite, 105 or concurrently)   *3 semester hours credit*

156   Organic Chemistry Laboratory II

Co-ordinated with the lecture course, Organic Chemistry II, and deals with the preparation and reactions of the aromatic compounds.

(Prerequisite, 155, 106 or concurrently)   *3 semester hours credit*

Sanitary Engineering Technology
Structural Engineering Technology
Surveying Technology

201   Surveying I

Basic surveying principles; theory of measurements; basic traverse computations; stadia principles; principles and procedures of the Massachusetts Land Court.

(Prerequisite, 702)   *3 semester hours credit*

202   Surveying II

Surveying principles as applied to simple, compound and vertical curves; spiral easement curves; earthwork computations and the solution of the Mass diagram.

(Prerequisite, 201)   *3 semester hours credit*

203   Transportation Engineering

Engineering considerations in the planning and construction of modern highways. Features of routing, such as horizontal and vertical curves, rates of grade, super elevation and traffic control are discussed. Flexible and Rigid pavements, Drainage and Frost Action are considered. A brief discussion of airport design and layout is included.

(Prerequisite, 202)   *3 semester hours credit*

204   Hydraulics

Basic principles of hydrostatics and hydrodynamics; pressures on submerged areas, fluid flow, flow meters, nozzles, weirs, pipe lines, pipe networks are considered. Open channels, Reynolds numbers and viscosity are also included.

(Prerequisite, 501, 502, 704)   *3 semester hours credit*

205   Structural Analysis I

Determination of reactions, sheers, bending moments and forces developed by loads on beams and trusses. Analytical and graphical methods are used. Influence lines for beams, girders and trusses, and solutions for absolute maximum moment in beams are discussed.

(Prerequisite, 504)   *3 semester hours credit*

206   Structural Analysis II

Analysis of forces from moving load systems and equivalent uniform loadings for bridge structures; deflections of structures by Virtual Work and Moment-Area. Slope-Deflection Least Work methods; Moment Distribution Method; solution of statically indeterminate structures.

(Prerequisite, 205)   *3 semester hours credit*

207 Concrete Design I

Principles of Concrete Mixture Design and the physical properties of concrete; fundamentals of reinforced concrete design including rectangular beams, beams reinforced for compression, and "T." beams. Both Elastic and Ultimate Strength Design principles are considered.

(Prerequisite, 504)   *3 semester hours credit*

208 Concrete Design II

Principles of reinforced concrete design as applied to an interior bay of a typical building; one way slabs, "T" beams, axially loaded and eccentrically loaded columns are considered. Footings and retaining walls are also discussed. Elastic and Ultimate Strength Design methods are used. ACI Building Code is discussed throughout the course.

(Prerequisite, 207)   *3 semester hours credit*

211 Water Supply

Principles of water supply engineering; population forecasting, quality and quantity of water for various uses; water treatment processes and the design of distribution systems.

(Prerequisite, 204, 102)   *3 semester hours credit*

212 Sewerage and Sewage Disposal

Collection and disposal of sewage and storm water including the collection of data necessary for the design of these systems. A discussion of modern methods of treatment and sewage plant operation.

(Prerequisite, 204, 211)   *3 semester hours credit*

215 Structural Drawing

Basic structural drafting; framing plans and details for engineering drawings of steel framed structures; framing plans and shop details for the above structures.

(Prerequisite, 601, 602)   *3 semester hours credit*

216 Structural Design I

Design and detailing of connections for structural members including seats, brackets and standard framed connections.

(Prerequisite, 215, 503)   *3 semester hours credit*

217 Structural Design II

Design of steel members in structural frames. Tension, compression, bending and eccentrically loaded members are considered.

(Prerequisite, 216, 504)   *3 semester hours credit*

218 Structural Design III

Design of structures as a whole; plate girders and highway bridges are

included. An introduction to Plastic Design Methods in steel is also included.
(Prerequisite, 217)   *3 semester hours credit*

221   Surveying III (Geodesy)

Introduction to observations on the sun for latitude, time and azimuth including basic spherical trigonometry, precise levelling, triangulation and base line measurements.
(Prerequisite, 202)   *3 semester hours credit*

222   Surveying IV (Photogrammetry)

Basic principles of photogrammetry and map making from aerial photographs. Modern methods of measurement including use of Geodimeter and Telurometer are included. Map projections are considered.
(Prerequisite, 221)   *3 semester hours credit*

223   Legal and Professional Aspects of Surveying

Mass. Land Court requirements, Subdivision Control Act, Recording and Conveyancing, and various laws relating to property line definitions as well as consideration of riparian rights.
(Prerequisite, 201, 202)   *3 semester hours credit*

224   Foundations and Structures

A basic course in the Analysis and Design of Structures, including the Foundations, designed to acquaint the surveyor with the various structural elements in large buildings.
(Prerequisite, 503)   *3 semester hours credit*

225   Computers

Use of Digital Computers such as IBM 650 and IBM 1620 in making traverse and earthwork calculations.
(Prerequisite, 201, 202)   *3 semester hours credit*

251   Survey, Field and Office Practice I

From data obtained in the field, the necessary calculations pertaining to closed traverse surveys will be made. A detailed plan of the traverse area will be drawn. Supplementary problems will be assigned for solving and drafting.
(Prerequisite, 601, 602, 201, 202)   *3 semester hours credit*

252   Survey, Field and Office Practice II

Problems and field work contained in open traverse surveying, laying out curves, earthworks (cut and fill) will be worked out. Observation for Time, True Azimuth, Latitude and Longitude from the sun and polaris will be made. Use of photogrammetry equipment in making maps from aerial surveys will conclude the course.
(Prerequisite, 221, 251)   *3 semester hours credit*

Electrical Engineering Technology

301   Direct-Current Circuit Theory

Introductory course in d-c circuits and magnetism, including steady and transient states, using basic laws and network theorems.

(Prerequisite, 701, 702)   *3 semester hours credit*

302   Alternating-Current Circuit Theory

Laws and theorems of course #301 applied to circuits and networks containing resistance, inductance and capacitance, and excited by alternating sinusoidal waveforms, which are represented for mathematical analysis by phasors in single phase and three phase phasor diagrams.

(Prerequisite, 301, 703)   *3 semester hours credit*

303   Direct-Current Machinery

General principles of energy convertion in shunt, series and compound direct-current machines. Electromotive forces and torques, commutation, armature reaction, losses, efficiency, ratings and methods of test.

Theory and operation of single-phase and poly-phase transformers. Vector analysis, voltage regulation and test methods.

(Prerequisite, 301, 302)   *3 semester hours credit*

304   Alternating-Current Machinery

Energy conversion by means of alternating-current synchronous and induction machines. Rotating magnetic fields, machine characteristics, torque, power angle, voltage and speed characteristics and methods of test.

(Prerequisite, 302, 303)   *3 semester hours credit*

305   Electronics for Industry

Basic electron tubes and semiconductors as applied to electronic control and regulation systems. Diode, triode, thyratron, amplification theory, rectification and filtering, general industrial control circuit applications.

(Prerequisite, 302, 303)   *3 semester hours credit*

306   Transmission and Distribution Theory

Transmission and distribution of alternating-current energy at power frequencies. Transmission-line problems both normal and abnormal or fault conditions. Symmetrical components, protection, station equipment and trends in the power industry.

(Prerequisite, 304)   *3 semester hours credit*

307   Computer Programming

Basic principles of computer programming involving a detailed study of the FORTRAN language. Written programs run on an IBM 1620 computer and taken from the field of electrical engineering including network

analysis, load flow studies, etc.

(Prerequisite, 704)   *3 semester hours credit*

353   Direct-Current Machinery Laboratory

Application of the material of Course 303 to laboratory experimentation. Tests on alternating-current power circuits, transformers, shunt, series and compound direct-current machinery; flux pattern studies.

(Prerequisite, 303 or concurrently)   *3 semester hours credit*

354   Alternating-Current Laboratory

Application of the material of Course 304 to laboratory experimentation. Tests on synchronous generators, motors; induction motors both three-phase and single-phase.

(Prerequisite, 304 or concurrently)   *3 semester hours credit*

355   Electronics for Industry Laboratory I

Electronic device and circuit experimentation as applied to industrial operations. Experiments on the use of the cathode-ray oscilloscope, the diode, triode, transistor characteristics, amplifiers and oscillators.

(Prerequisite, 305 or concurrently)   *3 semester hours credit*

356   Electronics for Industry Laboratory II

Experimentation on magnetic amplifiers, the thyratron tube, control of motor speed, generator voltage, polyphase rectification.
A study of the components and operation of servomechanisms.

(Prerequisite, 355)   *3 semester hours credit*

Electronic Engineering Technology

401   Wave Propagation

Application of fundamental principles of waves to electromagnetic radiation; antennas, waveguides, and the ionosphere.

(Prerequisite, 701, 702, 725, 726)   *3 semester hours credit*

402   Semiconductors and Transistors

Conduction of electricity in solids, photoelectric effect, crystal diodes, junction transistors, and transistor circuits.

(Prerequisite, 301, 725, 726)   *3 semester hours credit*

403   Electrical Measurements

Measurement of voltage, current, power, resistance, capacitance, inductance, impedance, frequency, tube characteristics, etc. Direct and substitution measurements. Evaluation of measured data — standard deviation and tolerance limits. Instrument calibrations — effect of residual impedances.

(Prerequisite, 301, 302, 704)   *3 semester hours credit*

405   Electron Tubes and Circuits I

Semi-conductors and vacuum diodes: PN junction diode current-voltage relations, space charge equation, and power considerations. Power supplies and filters: Half wave and full wave supplies, analysis of capacitor and inductor input filters. Study of polyphase rectifier circuits and regulated power supplies. Control Devices: Thyratron control devices and applications, methods of phase shift control. Vacuum Tubes: Triode and multi-grid tubes, equivalent circuits, analytical and graphical analysis of amplifier circuits. Determinative of decibel gain and input admittance. Cathode Ray Tubes: Study of sweep circuits, magnetic and electrostatic deflection.

(Prerequisite, 301, 302, 402, 704)   *6 semester hours credit*

406   Electron Tubes and Circuits II

Four Terminal Networks: Open circuit impedance, short circuit admittance and hybrid parameters. Transistors: Graphical and analytical analysis of transistors, equivalent circuits, bias stabilization. Vacuum Tube Amplifier: RC and transformer coupled amplifiers, audio and RF amplifiers. DC amplifiers, cascaded amplifiers, voltage and current feedback. Power Amplifiers: Class A, AB, and B operation, push-pull amplifiers and driver circuits. Photo-tube amplifiers. Waveshaping: Differentiating and integrating circuits.

(Prerequisite, 405)   *6 semester hours credit*

407   Communication Engineering I

Video amplifiers, voltage amplifiers, admittance and neutralization circuits, including grounded grid amplifiers, followed by class C and B power amplifiers, study of LC oscillators, including the various feedback circuits, crystal oscillators, parasitic oscillation and special oscillator circuits. Amplitude modulators, detectors and mixers, amplitude modulated transmitters and super-heterodyne receivers. Attention given to problems of selectivity, sensitivity, stability and fidelity of receivers.

(Prerequisite, 401, 406)   *6 semester hours credit*

408   Communication Engineering II

Frequency and Phase Modulation with reference to production and detection of these types of modulation. Switching, Timing, and Pulse Circuits are introduced, including the Multivibrator, Blocking, Oscillator, Phantastron, Operational Amplifiers, Clipping and Clamping Circuits, using both Tubes and Transistors.

(Prerequisite, 407)   *6 semester hours credit*

411   Bio-Electrical Measurements

Variation of Course #403 with special attention to physiological measurements.

(Prerequisite, 301, 302, 704)   *3 semester hours credit*

456   Electronic Laboratory

Experiments cover most of the subjects covered by lecture in Electron

Tubes and Circuits I and II. Electron emission, crystal and gas diodes, triodes, transistor characteristics, filter circuits, iron core reactors, thyratrons, half and full wave rectifiers, voltage-regulated power supplies, voltage amplifiers, vacuum tube and transistor resistance coupled cascade amplifiers, feed-back amplifiers, silicon controlled rectifiers, the use of impedance bridges. Laboratory reports are required on each experiment. Mid-term and final examinations also given.

(Prerequisite, 403, 406 or concurrently)   *3 semester hours credit*

457   Advanced Electronic Laboratory I

Covers the theory subjects studied in Communication Engineering course and advanced audio subjects from Electron Tubes and Circuits II. Transistorized audio power amplifiers, push-pull audio amplifiers, direct-coupled amplifiers, narrow and wide band intermediate frequency amplifiers, detectors, distortion in audio amplifiers, video amplifiers, transient circuits, frequency multipliers, crystal oscillators, power oscillators, audio oscillators, Class B and C RF amplifiers including neutralization, amplitude modulated RF amplifiers, clipping and clamping circuits, and use of Q-meters.

(Prerequisite, 407 or concurrently, 456)   *3 semester hours credit*

458   Advanced Electronic Laboratory II

Covers the theory subjects studied in the Communication Engineering II course. Balanced modulators, single side band generators, discriminators, ratio detectors, gated beam tubes, limiters, reactance modulators, networks in FM circuits, frequency dividing circuits used as counters, Phantastroms, Schmitt trigger circuits, multivibrators, and logic circuits. A complete television receiver in the form of a demonstrator is also studied for alignment, wave forms and trouble shooting, also pulse delay lines, analog computers, square wave guides, slotted lines, reflex klystrons, testing and alignment of complete radio receivers and Parametric amplifiers.

(Prerequisite, 457, 408 or concurrently)   *3 semester hours credit*

460   Bio-Electronic Laboratory

Experiments in the use of electronic instruments found in any medical electronic laboratory. Vacuum tube voltmeters. Cathode Ray Oscilloscopes, Paper Recorders, Power Supplies, and amplifiers, both vacuum tube and transistor. Experiments on the vacuum tube and transistor as a device are also covered. Then the special medical electronic devices such as Cardiographs, Brain wave, Pulse rate, and Blood pressure apparatus and nuclear radiation detectors will be used.

(Prerequisite, 411)   *3 semester hours credit*

Mechanical Engineering Technology

501   Applied Mechanics I

Principles of Statics. Resultants of Planar Force Systems. Equilibrium of Force Systems. Analysis of Structures.

(Prerequisite, 701, 702, 725, 726)   *3 semester hours credit*

502   Applied Mechanics II

Friction. Force Systems in Space. Centroids and Center of Gravity. Moment of Inertia. Polar Moment of Inertia. Product of Inertia.

(Prerequisite, 501)   *3 semester hours credit*

503   Strength of Materials I

Stress and deformation; mechanical properties of materials; special cases of stress due to axial loads; shear and bending moment in beams; stresses in beams and beam design.

(Prerequisite, 501, 502, 704)   *3 semester hours credit*

504   Strength of Materials II

Deflection of statically determinate beams; torsional stress, shafts and helical springs; combined stresses; riveted and welded joints; thin hollow cylinders; column action.

(Prerequisite, 503)   *3 semester hours credit*

505   Heat Engineering I

General theory of heat and matter; first and second laws of thermodynamics; equations of state, and thermodynamics of flow and non-flow; laws of perfect gases; properties of vapors and tables and charts.

(Prerequisite, 704, 725, 726)   *3 semester hours credit*

506   Heat Engineering II

Steam engines, turbines, condensers and auxiliary equipment; fuels and combustion in steam boilers; power plant layout, air compressors, internal combustion engines, gas turbines and refrigeration.

(Prerequisite, 505)   *3 semester hours credit*

507   Mechanism

Translatory and rotary motion involving basic mechanisms through graphical and mathematical analysis of displacement, velocity and acceleration; design of gear trains.

(Prerequisite, 501, 502, 603, 604)   *3 semester hours credit*

509   Machine Design I

Materials' properties; stress analysis; dynamic stresses; stress concentrations; long and short columns; fatigue; fluctuating stresses; manufacturing considerations and weld design.

(Prerequisite, 504)   *3 semester hours credit*

510   Machine Design II

Riveting of machine elements; screw fastening; keys, pins and cotters; press, shrink and friction joints; flat helical and torsion springs; cylinder heads and cover plates; brakes, flywheel design; and gearing.

(Prerequisite, 509)   *3 semester hours credit*

551   Mechanical Engineering Laboratory I

Tests on instrumentation, flow measurement, hydraulic machinery, stationary steam and internal combustion engines and simple testing of materials.

(Prerequisite, 504, 506)   *3 semester hours credit*

552   Mechanical Engineering Laboratory II

Tests on heating, refrigerating and air conditioning equipment, advanced internal combustion engines, air compressors, advanced testing of materials and experimental stress analysis.

(Prerequisite, 551)   *3 semester hours credit*

Drawing

601   Engineering Drawing I

Designed to meet the requirements of students who have had no previous instruction in drafting. Assignments include technique practice, instructions for reading a scale, tangent arcs and lines, lettering, auxilliary, and oblique views.

3 semester hours credit

602   Engineering Drawing II

Course content includes development of objects, intersections, isometric, cavalier and cabinet drawing, screw threads, detail and assembly drawings. A number of practical problems are included which relate to future professional courses.

(Prerequisite, 601)   *3 semester hours credit*

603   Machine Drawing I

Lectures and reading asignments correlated with classroom problems. Drawing techniques applicable to the particular study, American Standard drafting-room practices, methods and materials of machine production, fractional and decimal dimensioning systems, fasteners, bearings, lubrication, stamping, methods of reproduction, etc.

(Prerequisite, 601, 602)   *3 semester hours credit*

604   Machine Drawing II

Belt drives, spur, rack, internal, worm and level gears. Plate, face and cylindrical cams. Piping, clutches, couplings, jigs, fixtures and die casting. Design layouts of a simple jig, stamping machine and reducing gear box.

(Prerequisite, 603)   *3 semester hours credit*

Mathematics

700   Pre-Engineering Mathematics

An intensive review of high school Algebra I and Plane Geometry prepatory for Algebra, 701.

701   Algebra

A rapid review of the fundamental operations of Algebra. A thorough study of fractions, functions, linear and quadratic equations, equations in quadratic form, graphs, exponents, complex numbers, binomial expansion, variation, and equations of higher degree than the second.

(Prerequisite, 700 or Mathematics Placement Test) 3 semester hours credit

702   Trigonometry

The solution of all triangles by both natural and logarithmic functions, identities, radian measure, principal values and the solution of trigonometric equations. Particular attention is given to applications of Trigonometry to engineering practice.

(Prerequisite, 701 or concurrently)   3 semester hours credit

703   Analytical Geometry and Differential Calculus

Provides smooth transition from algebra and trigonometry into calculus. Includes the straight line, circle, conic sections with rectangular coordinates only; graphs of trigonometric, logarithmic, and exponential functions; differentiation of both explicit and implicit algebraic and transcendental functions; applications; slopes of curves, maxima and minima; derivatives of higher order; velocity and acceleration in rectilinear motion.

(Prerequisite, 701, 702)   3 semester hours credit

704   Integral Calculus

Integration as inverse of differentiation, and as limit of summation; methods of integration, integral tables, differential equations with variables separable, rectilinear motion; definite integrals, areas in rectangular coordinates, lengths of curves, volumes and surfaces of revolution; multiple definite (interated) integrals, centroids of plane areas, and moment of inertia.

(Prerequisite, 703)   3 semester hours credit

Physics

725   Physics I

A survey of the principles of mechanics covering topics such as force; work; energy; statics; dynamics; linear, rotational and harmonic motion; conservation laws. Group lecture demonstration periods.

(Prerequisite, 701 or concurrently)   3 semester hours credit

726   Physics II

A study of wave motion with applications to sound and light; selected topics in heat including calorimetry, expansion, change of phase, transfer of heat; selected topics in light including refraction, diffraction and interference, optical instruments; selected topics in electricity including direct and alternating current circuits, electromagnetic phenomena. Group lecture demonstration periods.

(Prerequisite, 725, 702 or concurrently)   *3 semester hours credit*

Nuclear Technology

901   Nuclear Technology I

Discovery and nature of radioactivity, alpha, beta and gamma radiation and application to biological and industrial problems, atomic structure, nuclear reactions, artificial transmutation, and nuclear instrumentation. Laboratory experiments where appropriate.

(Prerequisite, 703, 704, 725, 726)   *3 semester hours credit*

902   Nuclear Technology II

The fission process and its application, nuclear reactors, materials of construction. Radiation shielding, and radioactive waste disposal. Laboratory experiments where appropriate.

(Prerequisite, 901)   *3 semester hours credit*

Control Systems Engineering

927-928   Transients in Linear Systems I and II

Methods employed in writing integro-differential equations for electrical, mechanical, and electrochemical systems; network topology and duality; introduction to the methods of transformation calculus and complex frequency concepts. A varied selection of circuit problems are solved using Laplace transforms.

(Prerequisite, Associate Degree in Electrical or Electronic Engineering or the equivalent)   *4 semester hours credit*

931-932   Pulse Circuits I and II

Principles and techniques of pulse-forming circuits; applications to radar and digital computers; analysis and design of gates, matrix switches, multivibrators, blocking oscillators, sweep generators, delay lines; emphasizes transistors and semiconductors.

(Prerequisite, 927, 928)   *4 semester hours credit*

933-934   Transistor-Circuit Engineering I and II

Introduction to semiconductor physics which avoids the use of higher mathematics. Treatment for both the equivalent circuit and graphical methods; audio and power amplifiers; r-f and pulse circuits.

(Prerequisite, 927, 928)   *4 semester hours credit*

935-936   Servomechanisms I and II

Analysis and to some extent the synthesis of linear servomechanisms under both transient and steady rate conditions. Laplace transforms used in the formulation of block diagrams and transfer functions; system stability, figures of merit and their application to the design of compensated systems. Nyquist criteria log-modulus and root-locus methods are employed.

(Prerequisite, 927, 928)   *4 semester hours credit*

937-938   Analog and Digital Computers I and II

Principles of the design and application of analog and digital computers; operational amplifiers, solutions of equation systems, time and scale factors, simulation of servomechanisms, and special devices. Digital topics include Boolean algebra, elementary switching theory, simple computing circuits, and a detailed treatment of programming using the FORTRAN system. Some laboratory work is involved and use is made of an IBM 1620 digital computer.

(Prerequisite, 927, 928)   *4 semester hours credit*

943-944   Advanced Mathematics I and II

Elementary theory and application of differential equations to physical systems. (Primarily ordinary linear differential equations); principles of calculus and their use in solving first order differential equations, separation of variables, linear equations of first order, inputs and outputs of physical systems, linear differential equations of higher order, complex exponentials, Fourier Series and harmonic analysis, variation of parameters, method of undetermined coefficients; series solutions, numerical methods, introduction to LaPlace Transforms, applications to electrical and mechanical systems.

(Prerequisite, Associate Degree in Electrical or Electronic Engineering or the equivalent)   *4 semester hours credit*

945-946   Electric Circuit Theory I and II

General analysis of n-loop networks by loop current and node voltage variables using matrix Algebra. Driving point and transfer immittances. The two terminal-pair, image parameters, conventional filter theory including constant "k" and "m" — derived filters. Bartlett's bisection theorem, the symmetrical lattice, and lattice-derived filters. Discussion of the necessary and sufficient conditions for the physical realizing of impedance functions, positive real functions and Hurwitz polynomials. The Foster and Cauer canonic forms for R-L and R-C networks. Driving point synthesis for R-L, R-C and R-L-C networks.

(Prerequisite, Associate Degree in Electrical or Electronic Engineering or the equivalent)   *4 semester hours credit*

Faculty

THE STRENGTH of any educational institution lies in the quality of its faculty. This is especially true in a technical institute devoted to the training of mature men and women most of whom are already employed in their chosen professions.

The instructional staff of the Lincoln College is composed of men who have an active interest in the welfare of ambitious evening school students. They are men of culture and high ideals and are well qualified by training and experience to teach in their respective fields.

(As of January 1, 1964)

George H. Anderson   *Appointed 1956*
Commercial Art Diploma, Vesper George School of Art, 1948; Professional Artist, Portraiture and Illustration; Electronic Schematic and Mechanical Free Lance Technical Illustrator.
Engineering Drawing

Paul A. Andrews   *Appointed 1959*
B.A. Boston University, 1951 M.S. Northeastern University, 1957; Senior Scientist, Controls for Radiation, Inc.
Physical Chemistry

Robert B. Angus, Jr.   *Appointed 1950*
B.S. Northeastern University, 1947; M.S. Harvard University, 1953; P.E. (Mass.); Equipment Engineering Manager for the Program Development Office, Sylvania Electric Products, Inc.
Direct and Alternating-Current Circuit Theory

Roger M. Antoine   *Appointed 1955*
Baccalaureat, Marseille University, 1942; Licence es-Science, Marseille University, 1945; Diploma of Meteorology, Marseille University, 1946; Diploma of Engineering, Marseille School of Engineering, 1946; Assistant Professor of Mathematics, Northeastern University.
Analytic Geometry-Differential Calculus, Integral Calculus

Robert J. Averill   *Appointed 1957*
   S.B. Northeastern University, 1957; M.S. Northeastern University, 1959;
   Cambridge Electron Accelerator, Harvard University.
   *Direct and Alternating-Current Circuit Theory, Wave Propagation, Semi-
   conductors and Transistors*

Russell H. Babcock   *Appointed 1954*
   S.B. Tufts College, 1945; S.M. Harvard University, 1947; Diplomate,
   American Academy of Sanitary Engineers; P.E. (Mass., Maine, N. H.,
   Vermont); Manager, Water and Waste Division. The Foxboro Co., Foxboro,
   Massachusetts.
   Water Supply, Sewerage and Sewage Disposal

Hollis Baird   *Appointed 1945*
   Assistant Professor of Electrical Engineering, Northeastern University; Con-
   sulting Engineer, Radio and Television.
   Communication Engineering
   Chairman of the Department of Electronic Engineering

John C. Balsavich   *Appointed 1957*
   Massachusetts Radio School, 1956; Electronic Technician, Northeastern
   University.
   Advanced Electronic Laboratory, Electronic Laboratory

Paul F. Barrett   *Appointed 1958*
   B.S. University of New Hampshire, 1948; P.E. (New Hampshire); Projects
   Manager, Massachusetts Institute of Technology.
   Concrete Design

William T. Barry, Jr.   *Appointed 1956*
   Massachusetts Institute of Technology, 1930-1932; Graduate American
   Institute of Banking; Tax Accountant, State Street Bank and Trust Company.
   Engineering Drawing

Eugene R. Bartlett   *Appointed 1958*
   B.S.E.E. Northeastern University, 1957; M.S.E.E. Northeastern University,
   1959; Assistant Professor of Research in Communications, Northeastern
   University.
   Alternating Current Machinery Laboratory

Robert T. Bateman   *Appointed 1957*
   B.S. University of New Hampshire, 1937; M.A. University of Maine, 1950;
   Head of Mathematics Department, Wellesley Senior High School.
   Algebra, Trigonometry

G. Warren Bates   *Appointed 1949*
   B.S. Massachusetts Institute of Technology, 1926; M.A. Boston University,
   1938; Instructor, Medford High School.
   Pre-Engineering Mathematics, Algebra, Trigonometry

Adolph Baumann   *Appointed 1955*
   B.S. Kantonales Technikum, Winterthur, Switzerland, 1940; Graduate
   Studies, Massachusetts Institute of Technology; Technical Staff, ITT
   Communication Systems, Inc.
   Communication Engineering

Stanley A. Beecoff   *Appointed 1957*
   A.E. Lincoln Institute, 1957; B.B.A. Northeastern University, 1961; Factory
   Manager, Dynisco Division of American Brake Shoe Company.
   Electronic Laboratory

Matteo P. Berardi   *Appointed 1960*
   B.S. Northeastern University, 1960; M.S. Northeastern University, 1962;
   Engineer, American Science & Engineering.
   Mechanical Engineering Laboratory

Edward Bobroff   *Appointed 1946*
   B.M.E. Polytechnic Institute of Brooklyn, N. Y., 1940; P.E. (Mass.); Chief
   Engineer, Combat Systems, Boston Naval Shipyard.
   Analytic Geometry-Differential Calculus, Integral Calculus

Fletcher S. Boig   *Appointed 1945*
   B.S. Tufts College, 1932; M.S. Massachusetts Institute of Technology, 1933;
   Ed.M. Tufts College, 1937; Associate Professor of Chemistry, Northeastern
   University.
   Chairman of the Department of Chemistry

Edward J. Booth   *Appointed 1956*
   A.B. Boston College, 1933; Ed.M. Boston College Graduate School, 1937;
   Assistant Professor of Mathematics, Northeastern University.
   Analytic Geometry-Differential Calculus, Integral Calculus

Charles H. Bouchard   *Appointed 1957*
   B.S. Worcester Polytechnic Institute, 1951; Sales Engineer, Westinghouse
   Electric Corporation.
   Direct and Alternating-Current Circuit Theory

Kenneth E. Bourque   *Appointed 1959*
   B.S. Northeastern University, 1958; M.S. Northeastern University, 1960;
   Assistant Professor in Electrical Engineering, Northeastern University.
   Transients in Linear Systems

John P. Brady, Jr.   *Appointed 1958*
   S.B., M.S. Massachusetts Institute of Technology, 1953 P.E. (Mass.); Senior
   Project Engineer, Sanborn Company.
   Communication Engineering

Donald H. Breslow   *Appointed 1959*
   S.B. Brown University, 1954; M.S. Brown University, 1957; Manager, Power
   Devices Section, General Instrument Corp.
   Electron Tubes and Circuits

Karl L. Briggs   *Appointed 1957*
   B.S. Norwich University, 1942; M.A. Suffolk University, 1955; Head of
   Mathematics Department, Quincy High School.
   Algebra, Trigonometry

Curtis C. Brooks   Appointed 1937
   B.M.E. Northeastern University, 1924; A.M. Boston University, 1937; Retired.
   Analytic Geometry-Differential Calculus, Integral Calculus, Applied Mechanics

Franklyn K. Brown   Appointed 1955
Lowell Institute, 1939; B.S.Ed. Northeastern University, 1959; M.Ed. Northeastern University, 1963; Assistant Professor, Graphic Science, Northeastern University.
Engineering Drawing

William O. Bruehl   Appointed 1956
B.S. University of Maryland, 1928; Ordnance Engineer, United States Army Ordnance Corps; Assistant Professor, Mechanical Engineering, Northeastern University.
Mechanical Engineering Laboratory

Morris H. Burakoff   Appointed 1957
B.S. University of Massachusetts, 1940; P.E. (Mass.); Department Chief, Western Electric Co., North Andover, Mass.
Electrical Measurements, Alternating-Current Circuit Theory

George E. Burdick   Appointed 1950
A.B. Boston University, 1949; P.E. (Mass.); Consulting Engineer, Geo. Burdick Co.
Advanced Electronic Laboratory, Electronic Laboratory

James A. Caffrey   Appointed 1952
Ph.B. Boston College, 1922; M.Ed. Boston College, 1926; Instructor in Mathematics, Newman Preparatory School.
Pre-Engineering Mathematics, Algebra, Trigonometry

Leroy M. Cahoon   Appointed 1962
B.S. in C.E. Thayer School Dartmouth College, 1947; M.S. Northeastern University, 1956; P.E. (Mass.); Assistant Professor of Civil Engineering, Northeastern University.
Structural Design
Chairman of the Department of Civil Engineering

Francis J. Callahan   Appointed 1948
B.S.M.E. Northeastern University, 1948; P.E. (Mass.); Senior Project Engineer, International Equipment Co.
Mechanical Engineering Laboratory

Robert E. Cameron   Appointed 1956
B.S. Northeastern University, 1951; P.E. (Mass.); General Manager, Harry R. Feldman, Inc. Engineers.
Surveying

Frank R. Cangiano   Appointed 1957
B.S. Boston University, 1957; Instructor in Science and Mathematics, Hobbs Junior High School, Medford, Mass.
Pre-Engineering Mathematics

Michael A. Cangiano   Appointed 1946
S.B. Harvard University, 1933; Ed.M. Tufts College, 1949; Junior Submaster, Medford High School.
Algebra, Trigonometry
Chairman of the Department of Engineering Mathematics

Richard I. Carter   *Appointed 1955*

B.S. Northeastern University, 1952; M.S. Northeastern University, 1956; P.E. (Mass.); Associate Professor in Electrical Engineering and Director Computation Center, Northeastern University.
Analog and Digital Computers
Chairman of Control Systems Engineering Technology

Walter J. Casey   *Appointed 1955*

A.B. Boston College, 1951; M.Ed. Boston Teachers College, 1952; Head of Department of Mathematics, Boston English High School.
Algebra, Trigonometry

Walter J. Charow   *Appointed 1955*

B.S.E.E. Worcester Polytechnic Institute, 1949; M.S.E.E. Worcester Polytechnic Institute, 1950; P.E. (Mass.); Senior Engineer, Laboratory for Electronics, Inc.
Communication Engineering

William W. Chu   *Appointed 1963*

B.S.M.E. East China Institute of Technology, 1958; Graduate Assistant, Northeastern University.
Mechanical Engineering Laboratory

Philip J. Clang   *Appointed 1957*

B.S. University of Connecticut, 1950; P.E. (Mass.); Principal Structural Engineer, Jackson & Moreland, Inc., Engineers.
Strength of Materials

Laurence Fuller Cleveland   *Appointed 1931*

B.S. Worcester Polytechnic Institute, 1929; M.S. Massachusetts Institute of Technology, 1935; P.E. (Mass.); Professor of Electrical Engineering, Northeastern University.
Direct and Alternating-Current Machinery
Chairman of the Department of Electrical Engineering

Thomas C. Coleman   *Appointed 1960*

B.S.M.E. Tufts University, 1959; M.S.M.E. Northeastern University, 1961; Instructor in Mechanical Engineering, Northeastern University.
Mechanical Engineering Laboratory

Francis R. Collins   *Appointed 1963*

B.S. Northeastern University, 1961; M.S. Northeastern University, 1963; Member Technical Staff, Bell Telephone Laboratories.
D.C. Circuit Theory

Jerome J. Connor, Jr.   *Appointed 1957*

S.B. Massachusetts Institute of Technology, 1953; S.M. Massachusetts Institute of Technology, 1954; Sc.D. Massachusetts Institute of Technology, 1959; Assistant Professor of Civil Engineering, Massachusetts Institute of Technology.
Applied Mechanics

Roger T. Connor   *Appointed 1953*
  A.B. Boston College, 1952; M.Ed. State Teachers College, Boston, 1953;
  Head of Mathematics Department, Boston Trade High School.
  Analytic Geometry-Differential Calculus, Integral Calculus

Robert J. Connors   *Appointed 1947*
  B.S. Northeastern University, 1948; Manager, Production Engineering, Elec-
  tronic Systems, Sylvania Electric Products, Inc.
  Advanced Electronic Laboratory

Paul A. Cooper   *Appointed 1962*
  B.S.M.E. Northeastern University, 1962; Graduate Assistant, Northeastern
  University.
  Mechanical Engineering Laboratory

Albert L. Coyne   *Appointed 1948*
  B.S. University of Maine, 1915; Ed.M. Harvard University, 1937; P.E. (Mass.);
  Retired.
  Engineering Drawing

Gordon F. Currin   *Appointed 1961*
  B.S. Northeastern University, 1961; Instructor in Electrical Engineering,
  Northeastern University.
  Direct Current-Alternating Current Circuit Theory

Otis F. Cushman   *Appointed 1937*
  B.S. University of New Hampshire, 1932; M.S. University of New Hampshire,
  1934; Associate Professor of Graphic Science, Northeastern University.
  Engineering Drawing
  Chairman of the Department of Engineering Drawing

Herbert D. Davenport   *Appointed 1948*
  B.S. Northeastern University, 1937; Assistant Engineer, General Radio Co.
  Advanced Electronic Laboratory

Warren C. Dean   *Appointed 1941*
  A.B. Boston University, 1931; M.A. Boston University, 1940; Associate Pro-
  fessor of Mathematics, Northeastern University.
  Analytic Geometry-Differential Calculus, Integral Calculus
  Chairman of the Department of Advanced Mathematics

William P. Delaney   *Appointed 1960*
  RCA Institute, 1953; B.E.E. Rensselaer Polytechnic Institute, 1957; M.E.E.
  Massachusetts Institute of Technology, 1959; Staff Member, M.I.T. Lincoln
  Laboratory.
  Electronic Laboratory, Wave Propagation

J. James Devine   *Appointed 1939*
  B.S. University of Rhode Island, 1927; Sc.M. Brown University, 1936, P.E.
  (Mass.); Associate Professor of Graphic Science, Northeastern University.
  Engineering Drawing
  Assistant Chairman of the Department of Engineering Drawing

Peter C. DiCarlo *Appointed 1963*
B.S.M.E. Northeastern University, 1961; M.S.M.E. Northeastern University, 1963; Aerospace Research Engineer, Avco Research and Advanced Development Division.
Mechanical Engineering Laboratory

John F. Dobbyn *Appointed 1957*
A.B. Harvard University, 1912; Ed.M. Harvard University, 1925; Master, Newman Preparatory School.
Pre-Engineering Mathematics, Algebra, Trigonometry

H. Kenneth Dooley *Appointed 1958*
B.S. Boston College, 1951; M.Ed. State College at Boston, 1953; M.S. Clarkson College of Technology, 1963; Head of Mathematics Department, Braintree High School.
Pre-Engineering Mathematics

Henry B. Eden *Appointed 1957*
School of the Museum of Fine Arts, 1951; Art Director, Anco Technical Services, Inc.
Engineering Drawing

Lester K. Eigenbrod *Appointed 1963*
B.S. Northeastern University, 1963; Graduate Assistant, Northeastern University.
Mechanical Engineering Laboratory

Herbert E. Engel *Appointed 1958*
B.S. College of the City of New York, 1949; M.S. Northeastern University, 1961; Member, Technical Staff, Mitre Corporation.
Electron Tubes and Circuits

Charles Philip Engelhardt, Jr. *Appointed 1942*
B.S. Harvard University, 1928; Master of Architecture, Harvard University, 1930; Architect, Kilham, Hopkins, Greeley & Brodie.
Machine Drawing

Howard W. Evirs, Jr. *Appointed 1952*
B.S. Northeastern University, 1951; P.E. (Mass.); General Superintendent, Fitchburg Gas and Electric Light Company, Fitchburg.
Direct and Alternating-Current Circuit Theory
Chairman of the Department of Direct and Alternating-Current Theory

Martin J. Feeney *Appointed 1957*
B.S. Masachusetts Institute of Technology, 1931; Ed.M. Boston State Teachers College, 1938; Principal, Prince District, Boston Public Schools.
Pre-Engineering Mathematics, Algebra, Trigonometry

William D. Finan *Appointed 1946*
A.B. Boston College, 1938; M.A. Columbia University, 1941; Instructor in English and Mathematics, Weeks Junior High School, Newton.
Pre-Engineering Mathematics

Louis A. Fiore   *Appointed 1956*
A.E. Lincoln Technical Institute, 1944; B.B.A. Northeastern University, 1946;
Mechanical Engineer, Design Checker, American Science and Engineering, Inc.
Engineering Drawing

Robert F. Ford   *Appointed 1962*
B.S.E.E. Northeastern University, 1961; M.S.E.E. Northeastern University,
1963; Senior Engineer, Sylvania Electric Corporation.
Electronic Laboratory

Eugene G. Fortin   *Appointed 1958*
B.A. St. Anselm's College, 1954; Engineer, Radio Corporation of America.
General and Organic Chemistry Laboratory

Earlwood T. Fortini   *Appointed 1957*
Lowell Institute School, 1947; A.B. Harvard University, 1963; P.E. (Mass.);
Staff Engineer, Compugraphic Corp.
Machine Design

Arthur P. Fredericksen   *Appointed 1957*
Lincoln Institute; Industrial Engineer, Shoe Engineering Dept., United Shoe
Machinery Corp.
Engineering Drawing

John L. Freedman   *Appointed 1949*
S.B. Massachusetts Institute of Technology, 1932; P.E. (Mass.); Engineering
Specialist, Sylvania Systems Laboratory.
Electron Tubes and Circuits, Electronic Laboratory
Chairman of the Department of Electron Tubes and Circuits

Bronislaus J. Gedrewicz   *Appointed 1956*
B.S. Massachusetts Institute of Technology, 1931; Designer, Small Aircraft
Engine Department, General Electric Company.
Engineering Drawing

Alvin L. Glick   *Appointed 1958*
B.S. Polytechnic Institute of Brooklyn, 1953; M.S. Rutgers University, 1955;
Staff Member, Raytheon Company.
Wave Propagation

Richard E. Grojean   *Appointed 1955*
B.S. Northeastern University, 1948; M.S. Tufts University, 1950; Associate
Professor of Physics, Northeastern University.
Physics

Arthur F. Gustus   *Appointed 1963*
B.S. Boston State College, 1953; M.Ed. Boston State College, 1956; Physics
Instructor, Boston English High School.
Physics

Lawrence A. Haines   *Appointed 1956*
A.E. Lincoln Technical Institute, 1953; Manager Power Industry Sales and
Engineering, Mason-Neilan Division, Worthington Corporation.
Engineering Drawing

Joseph L. Hallett, Jr. *Appointed 1958*
S.B. Northeastern University, 1955; Engineer-in-Charge, Sylvania Electric Products.
Electronic Laboratory

Frank A. Hamilton *Appointed 1947*
A.E. Lincoln Technical Institute, 1939; Structural Engineer, Jackson & Moreland, Inc.
Structural Drawing, Structural Design

Alden G. Handy *Appointed 1957*
B.S. Boston University, 1924; M.A. Boston University, 1936; Consultant, Optics.
Physics

Francis R. Hankard *Appointed 1946*
S.B. Northeastern University, 1946; M.A. Boston University, 1949; Chemist, State Police Laboratories.
Physics

George S. Haralampu *Appointed 1963*
B.S. Tufts University, 1952; M.S. Northeastern University, 1960; P.E. (Mass.); Engineer, New England Electric System.
Computer Programming

Robert L. Harrington *Appointed 1948*
B.M.E. Clarkson College of Technology, 1939; M.S. Case Institute, 1941; P.E. (Mass.); Associate Professor of Mechanical Engineering, Tufts University.
Heat Engineering

Eric Harrison *Appointed 1949*
Wentworth Institute, 1920; B.S. Suffolk University, 1937; M.A. Suffolk University, 1951; Retired.
Engineering Drawing

Erhard J. Hofmann *Appointed 1956*
B.E.E. Polytechnic Institute of Brooklyn, 1954; M.S.E.E. Polytechnic Institute of Brooklyn, 1963; Senior Member, R.C.A.
Electronic Laboratory

Everett L. Hume *Appointed 1950*
B.S. 1933, M.S. 1933, Massachusetts Institute of Technology; P.E. (Mass.); Staff, Instrumentation Laboratory, Massachusetts Institute of Technology.
Hydraulics

Martin Idelson *Appointed 1956*
B.S.Ch. Polytechnic Institute of Brooklyn, 1952; Ph.D. Polytechnic Institute of Brooklyn, 1955; Scientist, Polaroid Corporation.
Organic Chemistry

Eugene F. Joyce *Appointed 1963*
U. S. Army, Retired; Electronics Technician, Northeastern University.
Electrical Engineering Laboratory

Stephen J. Kahne *Appointed 1963*
B.E.E. Cornell University, 1960; M.S. University of Illinois, 1961; Ph.D. University of Illinois, 1963; Air Force Officer, A F Cambridge Research Laboratories.
Advanced Mathematics

A. Louis Karp *Appointed 1956*
A.B. Harvard College, 1927; Ed.M. Boston University, 1931; Principal, Boston School Department.
Pre-Engineering Mathematics, Algebra, Trigonometry

Leon Katler *Appointed 1963*
Lowell Institute, 1949; P.E. (Mass.); Structural Engineer, The Badger Co.
Concrete Design

Louis Katona *Appointed 1959*
B.C.E. College of the City of New York, 1944; M.C.E. Polytechnic Institute of Brooklyn, 1948; P.E. (Mass. and N.Y.); Hydraulic and Sanitary Engineer, The Badger Co.
Hydraulics

Charles W. Kaufman *Appointed 1958*
B.S. Bridgewater Teachers College, 1939; Ed.M. Boston University, 1940; M.N.S. Worcester Polytechnic Institute, 1960; Head of Science Dept., Boston English High School.
Physics

John T. Keiran *Appointed 1957*
A.B. Boston College, 1933; A.M. Harvard University, 1935; Master, Boston Latin School.
Algebra, Trigonometry

Wayne G. Kellner *Appointed 1963*
B.S. University of Connecticut, 1955; S.M. Massachusetts Institute of Technology, 1957; Sc.D. Massachusetts Institute of Technology, 1963; Assistant Professor of Electrical Engineering, Northeastern University.
Electric Circuit Theory

George F. Kent *Appointed 1962*
B.S.M.E. Northeastern University, 1962; Graduate Assistant, Northeastern University.
Mechanical Engineering Laboratory

Nicholas P. Kernweis *Appointed 1957*
B.E.E. Polytechnic Institute of Brooklyn, 1952; M.S. Northeastern University, 1957; Research Physicist, Air Force Cambridge Research Laboratory.
Transients in Linear Systems

Bernard J. Kiley *Appointed 1958*
B.E. 1953, M.E. 1954, Yale University; P.E. (Mass.); Senior Engineer, Jackson & Moreland, Inc.
Applied Mechanics

Mark M. Kiley *Appointed 1955*
B.E. Yale University, 1948; M.E. Yale University, 1949; P.E. (Mass., R. I., La.); Consulting Engineer.
Strength of Materials

William F. King *Appointed 1957*
B.S. Northeastern University, 1957; M.S. Northeastern University, 1959; Assistant Professor of Electrical Engineering, Northeastern University.
Direct-Current Circuit Theory

John J. Klein *Appointed 1950*
B.S. Northeastern University, 1949; M.S. Northeastern University, 1955; Leader (Advanced Circuit Development), Aerospace Systems Division, Radio Corporation of America.
Transistor Circuit Engineering

Borah L. Kreimer *Appointed 1954*
B.S. North Carolina State College, 1940; Ed.M. Northeastern University, 1956; Associate Professor of Graphic Science, Northeastern University.
Mechanism

Horatio W. Lamson *Appointed 1945*
B.S. Massachusetts Institute of Technology, 1915; M.A. Harvard University, 1917; P.E. (Mass.); Research Engineer, Emeritus, General Radio Company.
Alternating-Current Circuit Theory, Electrical Measurements

Herbert C. Lang *Appointed 1936*
B.S. Northeastern University, 1934; P.E. (Mass.); Chief Draftsman, Mason-Neilan Division of Worthington Corporation.
Machine Drawing
Chairman of the Department of Machine Drawing

Robert S. Lang *Appointed 1955*
B.S. Northeastern University, 1945; Ed.M. Boston University, 1954; Associate Professor of Graphic Science, Northeastern University.
Engineering Drawing

Peter B. Lanzillotti *Appointed 1961*
B.S. Northeastern University, 1958; Instructor in Electrical Engineering, Northeastern University.
Electronics for Industry Laboratory

Aristotle T. Laskaris *Appointed 1960*
A.B. Boston University, 1954; M.S. Northeastern University, 1956; Senior Scientist, Avco Corp.
Qualitative and Quantitative Chemistry Laboratory

Clarence E. LeBell *Appointed 1955*
Lowell Institute, 1940; P.E. (Mass.); Mechanical and Electrical Engineering Designer, Aircraft Gas Turbine Division, General Electric Co.
Engineering Drawing

John Robert Leighton   *Appointed 1915*
  B.C.E. Northeastern University, 1914; Consultant, Wentworth Institute.
  Strength of Materials
  Chairman of Department of Strength of Materials

Nicholas J. Lembo   *Appointed 1953*
  B.S. Boston College, 1951; Ed.M. Boston Teachers College, 1952; M.S.
  Northeastern University, 1962; Assistant Professor of Physical Science, State
  Teachers College at Boston.
  Pre-Engineering Mathematics, Algebra, Trigonometry

Demetre P. Ligor   *Appointed 1959*
  B.S.E.E. Massachusetts Institute of Technology, 1949; P.E. (Mass.); Appli-
  cations Engineer, Applied Measurements, Inc.
  Wave Propagation, Semiconductors and Transistors

John W. F. Lloyd   *Appointed 1959*
  B.S.E.E. Northeastern University, 1958; Assistant Professor of Electrical
  Engineering, Northeastern University.
  DC-AC Machinery Laboratory

Andrew G. Lofgren   *Appointed 1946*
  Lowell Institute, 1932; A.A. Harvard University, 1942; Ed.M. Boston Uni-
  versity, 1946; Staff Appointment, Instrumentation Laboratory, Massachusetts
  Institute of Technology.
  Engineering Drawing

Roger G. Long   *Appointed 1952*
  A.E. Lincoln Technical Institute, 1950; Graduate Study, Harvard University,
  1950-51; B.B.A. Northeastern University, 1953; P.E. (Mass.); Scientific
  Executive, Edgerton Germeshausen & Grier.
  Advanced Electronic Laboratory

Kenneth A. Lucas   *Appointed 1950*
  S.B. Massachusetts Institute of Technology, 1925; M.Ed. Boston University,
  1931; P.E. (Mass.); Reg. Land Surveyor (Mass.); Chief of Survey, Whitman
  & Howard, Inc.
  Surveying

John F. Lutkevich   *Appointed 1956*
  A.E. Lincoln Technical Institute, 1952; B.B.A. Northeastern University, 1954;
  Senior Engineer, Sylvania Electric Products, Inc.
  Machine Drawing

Andrew C. MacAulay, Jr.   *Appointed 1960*
  B.S. Northeastern University, 1953; M.S. Northeastern University, 1957;
  Director Core Laboratory, New England Medical Center.
  General Chemistry

Alvin Mandell   *Appointed 1950*
  B.E.E. College of the City of New York, 1943; M.S.E.E. Northeastern Uni-
  versity, 1955; P.E. (Mass.); Senior Project Engineer, Avco Radio and
  Advanced Development Division.
  Advanced Electronic Laboratory

Jack I. Mann *Appointed 1960*
B.S.C.E. Munich Polytech, 1951; M.S. Northeastern University, 1959; P.E. (Mass., Vermont.); Senior Engineer, Jackson & Moreland, Inc.
Structural Analysis

Robert C. Marini *Appointed 1960*
B.S. Northeastern University, 1954; S.M. Harvard University, 1955; P.E. (Mass., N.Y.); Project Engineer, Camp, Dresser & McKee.
Hydraulics

Alexander G. Marshall, Jr. *Appointed 1957*
A.B. Middlebury College, 1951; M.A. Boston University, 1954; Mathematics Instructor, Lincoln-Sudbury Regional High School.
Algebra, Trigonometry

John D. Mazgelis *Appointed 1957*
Industrial Technical Institute, 1956; Customer Engineer, International Business Machines Corp.
Electronic Laboratory

Francis T. McCabe *Appointed 1952*
B.S. University of Maine, 1917; Ed.M. Harvard University, 1928; Formerly Headmaster, Rindge Technical School.
Engineering Drawing

Edward F. McCarren, Jr. *Appointed 1951*
A.E.E. Lincoln Technical Institute, 1951; Engineer, Baldwin-Lima-Hamilton Corp.
Advanced Electronic Laboratory

James F. McDonough *Appointed 1963*
B.S. Northeastern University, 1962; Design Engineer, Firnkas Engineering Co.
Surveying

Vernon S. McFarlin *Appointed 1953*
B.E.E. Northeastern University, 1931; P.E. (Mass.); Supervising Engineer, Boston Edison Company.
Algebra, Trigonometry

Eugene L. McLaughlin *Appointed 1956*
A.B. Boston College, 1929; M.A. Boston College Graduate School, 1931; Head of Mathematics Department, Hyde Park High School.
Algebra, Trigonometry

Robert F. McMahon *Appointed 1956*
B.S. University of Maine, 1953; M.S. Harvard University, 1954; Sales Manager, Controls for Radiation, Inc.
Algebra, Trigonometry

Carl J. Mellea *Appointed 1960*
S.B. Northeastern University, 1949; M.S. Northeastern University, 1960; P.E. (Mass., R. I., Maine, Vt., N. H.); Structural Engineer, Howard, Needles, Tammen & Bergendoff.
Structural Analysis

Carl Miller *Appointed 1945*
A.B. Harvard University, 1929; LL.B. Boston University, 1933; Ed.M. Boston
Teachers College, 1935; Assistant Principal, Boston School Department.
Pre-Engineering Mathematics, Algebra, Trigonometry
Chairman of Department of Pre-Engineering Mathematics

Richard W. Miller *Appointed 1959*
B.S. Northeastern University, 1958; M.S. Northeastern University, 1960;
P.E. (Mass.); Research Engineer, Foxboro Co.
Mechanical Engineering Laboratory

Ernest E. Mills *Appointed 1947*
B.S. Northeastern University, 1946; M.S. Northeastern University, 1954;
P.E. (Mass.); Associate Professor of Mechanical Engineering, Northeastern
University.
Mechanical Engineering Laboratory
Chairman of the Department of Mechanical Engineering

Theodore J. Morin, Jr. *Appointed 1961*
S.B. Northeastern University, 1959; M.A. College of William and Mary, 1961;
Instructor of Physics, Northeastern University.
Physics

George Moy *Appointed 1962*
B.S.M.E. Northeastern University, 1962; Graduate Assistant, Northeastern
University.
Mechanical Engineering Laboratory

Markos A. Noussias *Appointed 1962*
B.S. Northeastern University, 1962; Graduate Assistant, Northeastern Uni-
versity.
Mechanical Engineering Laboratory

James H. Nye *Appointed 1963*
B.S. Northeastern University, 1940; Production Engineer, General Radio Co.
Electronics for Industry, Advanced Electronic Laboratory

John R. O'Brien *Appointed 1946*
A.B. Boston College, 1933; A.M. Boston College, 1934; Head of Mathematics
Dept., English High School, Boston.
Analytic Geometry-Differential Calculus, Integral Calculus

John C. O'Callahan *Appointed 1961*
B.S. Northeastern University, 1961; M.S. Northeastern University, 1963;
Instructor Mechanical Engineering, Northeastern University.
Mechanical Engineering Laboratory

Thomas J. Owens *Appointed 1952*
A.B. Boston College, 1943; M.Ed. Boston College, 1961; Instructor in Mathe-
matics, Quincy High School.
Analytic Geometry-Differential Calculus, Integral Calculus

James A. Palmer *Appointed 1961*
Electronic Technician, Northeastern University.
Electrical Engineering Laboratory

Normand A. Paquette *Appointed 1958*
A.E. Lincoln Institute, 1956; B.B.A. Northeastern University, 1958; Senior
Field Engineer, Yewell Associates, Inc.
Advanced Electronic Laboratory

Burton S. Parker *Appointed 1963*
B.S. Northeastern University, 1944; P.E. (Mass.); Mechanical Engineer,
U. S. Army Materials Research Agency.
Applied Mechanics

William M. Parker *Appointed 1957*
LL.B. Northeastern University, 1925; A.E. Lincoln Institute, 1956; Senior
Device Engineer, Minneapolis-Honeywell Regulator Co., Aero-Boston Division.
Algebra, Trigonometry

William H. Parmenter *Appointed 1952*
A.E. Lincoln Technical Institute, 1948; B.B.A. Northeastern University, 1952;
Engineer, Baird-Atomic, Inc.
Advanced Electronic Laboratory

Donald Paterson *Appointed 1959*
B.S. Northeastern University, 1958; M.S. Northeastern University, 1960;
Senior Engineer, Technical Research Group.
Heat Engineering

Charles H. Price, Jr. *Appointed 1960*
B.S. Northeastern University, 1955; M.S. Northeastern University, 1960;
Assistant Professor of Research in Communications, Northeastern University.
Direct Current-Alternating Current Machinery Laboratory

Sidney F. Quint *Appointed 1954*
S.B. Northeastern University, 1946; S.M. Massachusetts Institute of Tech-
nology, 1950; P.E. (Mass.); Staff Engineer, Raytheon Company.
Electron Tubes and Circuits

Gerard H. Ratcliffe *Appointed 1955*
A.B. Boston University, 1949; Research Engineer, Sylvania Electric Products,
Inc.
Advanced Electronic Laboratory

Edward L. Rich *Appointed 1956*
B.S. Northeastern University, 1952; M.S. Northeastern University, 1956; P.E.
(Mass.); Manager, Sylvania Electric Products, Inc.
Machine Design, Heat Engineering

David E. Rosengard *Appointed 1946*
A.B. Harvard College, 1931; A.M. Harvard University, 1932; Head of Mathe-
matics Department, Girls Latin School, Boston.
Analytic Geometry-Differential Calculus, Integral Calculus

Barnet Rudman   *Appointed 1942*
  A.B. Harvard University, 1921; Ed.M. Boston Teachers College, 1934;
  Associate Professor of Mathematics, Northeastern University.
  Analytic Geometry-Differential Calculus, Integral Calculus

Richard L. Savage   *Appointed 1955*
  B.S. University of Maine, 1950; M.S. Northeastern University, 1955; P.E.
  (Mass.); Associate Professor of Civil Engineering, Tufts University; Consult-
  ing Engineer, Hayden, Harding & Buchanan, Inc.
  Applied Mechanics

Donald S. Scheufele   *Appointed 1962*
  B.S. Tufts University, 1949; M.S. Tufts University, 1950; Ph.D. University of
  Massachusetts, 1958; Research Associate, Retina Foundation.
  Qualitative Chemistry, Quantitative Chemistry

Henry Schwartz   *Appointed 1958*
  A.B. University of California, 1939; M.Ed. Teachers College, North Adams,
  1944; P.E. (Mass.); Field Engineer.
  Physics

Harold M. Sharaf   *Appointed 1955*
  B.S., M.S. Massachusetts Institute of Technology, 1952; President, Tenco
  Electronics, Inc.
  Communication Engineering

William M. Sherry   *Appointed 1962*
  B.S. Boston College, 1955; M.S. University of New Hampshire, 1957; Re-
  search Physicist, Avco Corp.
  Wave Propagation

Gordon N. Smith   *Appointed 1957*
  B.S. Massachusetts Institute of Technology, 1954; P.E. (R. I.); Chief En-
  gineer, Monitor and Control Division, Fenwal Corporation.
  Communication Engineering

S. Leonard Spitz   *Appointed 1955*
  B.S. Northeastern University, 1946; P.E. (Mass.); Senior Engineer, Comstock
  and Wescott.
  Heat Engineering

Richard R. Stewart   *Appointed 1961*
  B.S.Ch.E. Northeastern University, 1960; M.S.Ch.E. Northeastern University,
  1963; Assistant Professor in Chemical Engineering, Northeastern University.
  Nuclear Technology

Robert B. Stitt   *Appointed 1959*
  B.B.A. Northeastern University, 1959; Product Manager, Edgerton, Germes-
  hausen & Grier, Inc.
  Electronic Laboratory

Raimundas Sukys   *Appointed 1962*
  B.S. Northeastern University, 1958; M.S. Northeastern University, 1961;
  Assistant Professor of Research in Electrical Engineering, Northeastern
  University.
  Pulse Circuits

Maurice Temple   *Appointed 1956*
  B.S. Northeastern University, 1947; M.Ed. Boston State College, 1952; Head
  of Science Department, Hingham High School.
  Pre-Engineering Mathematics, Algebra, Trigonometry

Robert L. Thing   *Appointed 1957*
  B.S. 1943, M.S. 1951, University of Illinois; Development Engineer, Mason-
  Neilan Division, Worthington Corporation.
  Electron Tubes and Circuits

Phineas Tobe   *Appointed 1960*
  A.B. Harvard College, 1932; Ed.M. Boston Teachers College, 1935; Head of
  Science Department, Girls Latin School.
  Physics

Frank E. Truesdale   *Appointed 1957*
  B.S. University of Massachusetts, 1950; Assistant Professor in Graphic
  Science, Northeastern University.
  Engineering Drawing

Arthur M. Vuilleumier   *Appointed 1953*
  Instructor in Electronics, Weymouth Technical Vocational High School,
  Related Instructor.
  Advanced Electronic Laboratory

Richard Wadler   *Appointed 1953*
  A.M.E. Lincoln Technical Institute, 1947; P.E. (Mass.); Mechanical Engineer,
  The Associated Designers, Inc.
  Machine Design

Thomas H. Wallace   *Appointed 1941*
  S.B. Boston University, 1933; M.A. Harvard Graduate School, 1936; Ph.D.
  Boston University, 1939; Professor of Physics, Northeastern University.
  Physics
  Chairman of the Department of Physics

John E. Walsh   *Appointed 1947*
  A.B. St. Michael's College, 1938; A.M. Boston University, 1940; Staff Spec-
  ialist, Wayland Laboratory, Raytheon Company.
  Analytic Geometry-Differential Calculus, Integral Calculus

John L. Warner   *Appointed 1948*
  B.S. Tufts College, 1942; M.S. Harvard University, 1950; P.E. (Mass.); Staff
  Member, M.I.T. Lincoln Laboratory.
  Transmission Line Theory

George E. Washburn   *Appointed 1957*
  S.B. Massachusetts Institute of Technology, 1909; Ph.D. University of Berlin,
  1914; Retired.
  Physics

Charles I. Waterman *Appointed 1956*
B.S.E.E. Northeastern University, 1947; M.S.E.E. Harvard University Graduate School of Engineering, 1948; P.E. (Mass.); Design Engineer, General Electric Company.
Direct and Alternating-Current Circuit Theory

Frank S. Weinert *Appointed 1957*
A.B. Harvard College, 1948; B.S. Columbia University, 1951; M.S. Columbia University, 1952; Optometrist.
Algebra, Trigonometry

Morton D. Weinert *Appointed 1955*
A.B. Harvard University, 1938; Ed.M. Boston Teachers College, 1939; M.Ed. Harvard University, 1963; Head of the Mathematics Department, Boston Latin School.
Analytic Geometry-Differential Calculus, Integral Calculus

George B. Welch *Appointed 1946*
B.S. Bowdoin College, 1922; Ph.D. Cornell University, 1928; Professor Emeritus of Physics, Northeastern University.
Wave Propagation, Semiconductors and Transistors

Ralph A. Wellings *Appointed 1955*
B.S. Boston College, 1955; M.Ed. State College at Boston, 1960; Mathematics Instructor, Boston Public Schools.
Algebra, Trigonometry

Ralph E. Wellings *Appointed 1944*
A.B. Boston College, 1920; A.M. Boston College, 1925; Ed.M. Boston Teachers College, 1930; Head of Science Department, Brighton High School.
Phyiscs

Thomas F. White *Appointed 1957*
B.S. Mathematics, Boston College, 1951; B.S. Massachusetts Maritime Academy, 1952; M.Ed. Bridgewater State Teachers College, 1952; Instructor of Mathematics, Quincy High School.
Algebra, Trigonometry

Williard B. Whittemore *Appointed 1957*
B.S. in C.E. Massachusetts Institute of Technology, 1932; Ed.M. Boston University, 1946; C.A.G.S. Boston University, 1956; Instructor in Mathematics, Everett High School.
Pre-Engineering Mathematics

Rudolph P. Widman *Appointed 1963*
A. B. Eastern Nazarene College, 1962; Teaching Fellow, Northeastern University.
General Chemistry Laboratory

Joseph F. Willard *Appointed 1949*
B.S. Northeastern University, 1949; P.E. (Mass.); Senior Civil Engineer, Electronic Computer Section, Massachusetts Department of Public Works.
Transporation Engineering

Donald K. Willim   *Appointed 1961*
  B.S. Maryland University, 1957; M.S. Northeastern University, 1961; P.E.
  (Mass.); Senior Engineer, DECO Electronics.
  Wave Propagation, Semiconductors and Transistors

Albert G. Wilson, Jr.   *Appointed 1948*
  B.S. in Civil Engineering, Thayer School, Dartmouth, 1946; M.S. Case Insti-
  tute of Technology, 1948; P.E. (Mass.); S.E. (Ill.); Member Gilbert Small &
  Co., Consulting Engineers.
  Applied Mechanics
  Chairman of Department of Applied Mechanics

Kenneth S. Woodward   *Appointed 1962*
  B.S.A.E. Tri-State College, 1951; Assistant Professor of Graphic Science,
  Northeastern University.
  Engineering Drawing

Robert D. Wright   *Appointed 1955*
  A.E. Lincoln Institute, 1955; Graduate Study, Northeastern University;
  Engineer-in-Charge, Data Systems Operations, Sylvania Electric Products, Inc.
  Electron Tubes and Circuits, Electronic Laboratory

NORTHEASTERN UNIVERSITY
Lincoln College

360 Huntington Avenue   Boston, Massachusetts 02115

19____

To the Dean:

_____ hereby apply for admission to the

(First name)   *(Middle name)*   *(Last name)*

Lincoln College in the term beginning _____ and submit the following information:

(Sept. - Jan. - June)

_____

(Street address)   *(Town)*   *(State)*   *(Phone)*

Age _____ Date of Birth _____

Citizen of U. S.   Yes ☐   No ☐   Married ☐   Single ☐

Name of your employer _____

Nature of your employment _____

Business address _____ Business telephone _____

I have attended, including other schools of the Northeastern University system, the following schools above grammer grade (if attendance at a university, **designate school**):

Name of School	Location — City, State	Chk. Yrs. Attended 1 2 3 4	Date Left	Date of Graduation	Degree if any

I request advanced standing credit for previous college work completed at (name of institution)

_____ I shall furnish transcript.

(OVER)

85

I wish to enroll for the Degree of Associate in Engineering or Science in the following curriculum: —

- [ ] Chemistry
- [ ] Electrical Engineering Technology
- [ ] Electronic Engineering Technology
- [ ] Bio-Electronic Engineering Technology
- [ ] Mechanical Engineering Technology
- [ ] Sanitary Engineering Technology
- [ ] Structural Engineering Technology
- [ ] Surveying Technology

- [ ] I wish to take the Pre-Engineering program with the major checked above.
- [ ] Program leading to the Certificate in Control Systems Engineering.
- [ ] As a special student, in the following courses:

....
....

Please answer the following questions:

Have you passed a course in First Year High School Algebra?   If so, give approximate year
Have you passed a course in High School Plane Geometry?   If so, give approximate year

Are you to take these courses under the Veterans Administration?   Yes [ ]   If Yes   [ ] Korean War (P.L. 550)
No [ ]   [ ] Other
(Specify)

Application Accepted by

....
....

Signature of Student

A fee of ten dollars must accompany this application. This fee is not returnable.

86

NORTHEASTERN UNIVERSITY

COLLEGE OF LIBERAL ARTS

Offers full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Arts.

COLLEGE OF EDUCATION

Offers full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Science in Education in preparation for teaching or administrative positions in elementary or secondary schools.

COLLEGE OF BUSINESS ADMINISTRATION

Offers full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Science in Business Administration.

COLLEGE OF ENGINEERING

Offers full-time day curricula on the Co-operative Plan and a part-time evening program, both leading to the degree of Bachelor of Science in Engineering.

COLLEGE OF PHARMACY

Offers full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Science in Pharmacy.

COLLEGE OF NURSING

Offers full-time, three-year curricula on the Co-operative Plan, leading to the Associate Degree and prepares candidates for the R.N. Examinations.

For further information
regarding any of the above colleges, address
DR. GILBERT C. GARLAND, *Dean and Director of Admissions*
360 Huntington Avenue, Boston, Massachusetts 02115, Tel. 262-1100
Inquiries concerning
the Graduate Division, University College, and Lincoln College
should be sent to the respective deans

GRADUATE DIVISION

Actuarial Science — Offers a program leading to the degree of Master of Science in Acturial Science.

Arts and Sciences — Offers programs leading to the degrees of Master of Arts and Master of Science, and to Ph.D. degrees in Physics and Chemistry.

Business — Offers evening programs leading to the degree of Master of Business Administration.

Education — Offers late afternoon, evening, and Saturday morning programs leading to the degree of Master of Education.

Engineering — Offers programs leading to the degree of Master of Science with course specification and to the Ph.D. degree in the fields of Electrical and Chemical Engineering.

Pharmaceutical Sciences — Offers programs leading to the Master of Science degree with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

UNIVERSITY COLLEGE

Offers part-time evening programs in various fields of business and the liberal arts designed especially to meet the needs of employed personnel and leading to the Bachelor of Science degree or to appropriate associate degrees.

LINCOLN COLLEGE

Offers part-time evening curricula in science and in engineering technology leading to the degrees of Associate in Science and Associate in Engineering.

NORTHEASTERN
UNIVERSITY

GRADUATE DIVISION

1964-1965 CATALOG

TABLE OF CONTENTS

GRADUATE DIVISION
NORTHEASTERN UNIVERSITY

GRADUATE SCHOOL OF ACTUARIAL SCIENCE
MASTER OF SCIENCE IN ACTUARIAL SCIENCE

GRADUATE SCHOOL OF ARTS AND SCIENCES
DOCTOR OF PHILOSOPHY
in the fields of
CHEMISTRY AND PHYSICS

MASTER OF SCIENCE
in the fields of
BIOLOGY, CHEMISTRY, MATHEMATICS and PHYSICS

MASTER OF ARTS
in the fields of
ENGLISH, HISTORY, POLITICAL SCIENCE, PSYCHOLOGY
and SOCIOLOGY-ANTHROPOLOGY

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
MASTER OF BUSINESS ADMINISTRATION

GRADUATE SCHOOL OF EDUCATION
MASTER OF EDUCATION

GRADUATE SCHOOL OF ENGINEERING
DOCTOR OF PHILOSOPHY
in the fields of
CHEMICAL ENGINEERING, and ELECTRICAL ENGINEERING
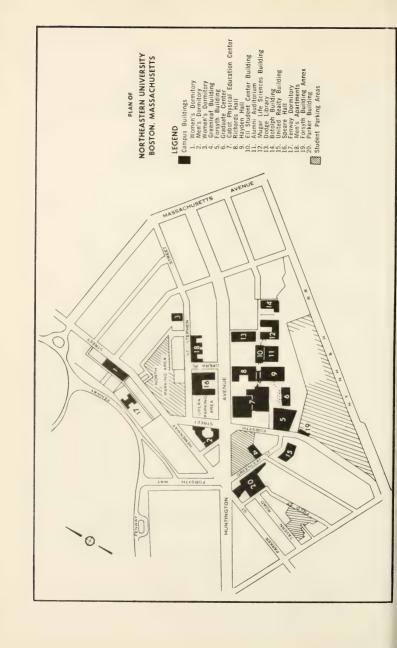
MASTER OF SCIENCE
in the fields of
CHEMICAL ENGINEERING, CIVIL ENGINEERING
ELECTRICAL ENGINEERING, INDUSTRIAL ENGINEERING
ENGINEERING MANAGEMENT, and MECHANICAL ENGINEERING

GRADUATE SCHOOL OF PHARMACEUTICAL SCIENCES
MASTER OF SCIENCE
in

HOSPITAL PHARMACY	MEDICINAL CHEMISTRY
INDUSTRIAL PHARMACY	PHARMACOLOGY

PLAN OF
NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS

LEGEND

Campus Buildings

1. Women's Dormitory
2. Men's Dormitory
3. Women's Dormitory
4. Greenleaf Building
5. Forsyth Building
6. Graduate Center
7. Cabot Physical Education Center
8. Richards Hall
9. Hayden Hall
10. Ell Student Center Building
11. Alumni Auditorium
12. Mugar Life Sciences Building
13. Dodge Library
14. Botolph Building
15. United Realty Building
16. Speare Hall
17. Fenway Dormitory
18. Men's Apartments
19. Forsyth Building Annex
20. Parker Building

▨ Student Parking Areas

The Governing Boards and Officers of the University

- The Corporation
- The Board of Trustees
- General University Committees
- Officers of Administration

4

ALUMNI TERM MEMBERS

CLASS OF 1964

CLASS OF 1965

CLASS OF 1966

CLASS OF 1967

PRESIDENT OF THE ALUMNI ASSOCIATION

GENERAL UNIVERSITY COMMITTEES

THE EXECUTIVE COUNCIL OF THE UNIVERSITY

Asa S. Knowles, Chairman

William C. White, Vice Chairman

Loring M. Thompson, Secretary

John S. Bailey	Edward S. Parsons
Lincoln C. Bateson	F. Weston Prior

THE ACADEMIC COUNCIL OF THE UNIVERSITY

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William C. White, Vice Chairman

Kenneth G. Ryder, Secretary

Lawrence A. Allen	Donald H. MacKenzie
Martin W. Essigmann	Roland H. Moody
Albert E. Everett	Rudolph M. Morris
Gilbert C. Garland	Ronald E. Scott
Roger S. Hamilton	Loring M. Thompson
Arnold E. Hanson	Lester S. Vander Werf
LeRoy C. Keagle	Arthur A. Vernon
Wilfred S. Lake	Charlotte E. Voss
Gilbert G. MacDonald	Roy L. Wooldridge

THE FACULTY SENATE

*William C. White, Chairman

David W. Barkley, Vice Chairman

Edward M. Cook, Secretary

Wendell R. Brown	*Gilbert G. MacDonald
Laurence F. Cleveland	Carl F. Muckenhoupt
Charles H. Dufton	Herbert C. Raubenheimer
*Martin W. Essigmann	Nathan W. Riser
Arthur R. Foster	Louis E. Roberts
David R. Freeman	Raymond H. Robinson
Benjamin C. Friedrich	Gustav S. Rook
*Roger S. Hamilton	Norman Rosenblatt
*Arnold E. Hanson	James J. Ryan
Sidney Herman	*Kenneth G. Ryder
O. James Inashima	*Ronald E. Scott
Lyman A. Keith	Albert Slavin
William F. King	Ernest L. Spencer
*Wilfred S. Lake	Ralph A. Troupe

Saverio Zuffanti

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*Appointed by the President

7

THE UNIVERSITY CABINET
William C. White, Chairman

Gurth I. Abercrombie
Donald L. Adams
Lawrence A. Allen
Dean S. Ammer
John S. Bailey
Charles O. Baird, Jr.
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Lincoln C. Bateson
Russell E. Brillhart
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Geoffrey Crofts
Charles M. Devlin
Dorothy G. Dissell
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Martin W. Essigmann
Albert E. Everett
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Herbert W. Gallagher
Harold A. Garabedian
Gilbert C. Garland
James E. Gilbert
Bernard P. Goldsmith
Carlo E. Gubellini
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Louise Hord
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LeRoy C. Keagle
Christopher F. Kennedy
Charles E. Kitchin
Wilfred S. Lake

Herman V. LaMark
George M. Lane
George B. Le Beau
Donald W. Lovejoy
Gilbert G. MacDonald
Donald H. MacKenzie
Alan A. Mackey
George A. Mallion
Frank E. Marsh, Jr.
Thomas E. McMahon
Roland H. Moody
Rudolph M. Morris
Rudolf O. Oberg
Edward S. Parsons
Philip W. Pendleton
F. Weston Prior
Daniel J. Roberts, Jr.
Edward W. Robinson
Kenneth G. Ryder
Ronald E. Scott
Robert Sheehan
George A. Speers
Myron J. Spencer
Richard E. Sprague
Alden G. Stevens
J. Kenneth Stevenson
Descomb T. Stewart
William M. Stewart
Donald J. Taylor
Clarence H. Thompson
Loring M. Thompson
Lester S. Vander Werf
Arthur A. Vernon
Charlotte E. Voss
Louis Vrettos
William Wallace
John B. Whitla
Roy L. Wooldridge

Asa S. Knowles, ex officio

THE ADVISORY COMMITTEE ON GRADUATE SCHOOL POLICY
Arthur A. Vernon, Chairman
Janice Walker, Secretary

Sze-Hou Chang
Roger S. Hamilton
George W. Hankinson
Victor E. Howes
LeRoy C. Keagle
Reginald G. Lacount
Wilfred S. Lake
Frank E. Marsh

Raymond H. Robinson
Kenneth G. Ryder
Ronald E. Scott
Robert A. Shepard
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Lester S. Vander Werf
William C. White
Roy L. Wooldridge

ADMINISTRATIVE ORGANIZATION

OFFICERS OF THE UNIVERSITY

Asa S. Knowles, A.B., A.M., LL.D., Litt.D., Sc.D.	President
Carl S. Ell, A.B., M.S., Sc.D., L.H.D., LL.D., D.S.Ed.	President Emeritus
William C. White, B.S., Ed.M., Eng.D.	Vice President and Provost

OFFICERS OF GENERAL ADMINISTRATION

John S. Bailey, B.S., M.B.A.	Director of Public Relations and Assistant to the President
Lincoln C. Bateson, B.B.A., M.B.A.	Financial Officer
Edward S. Parsons, B.S., Ed.M.	Business Manager
F. Weston Prior, B.S.	Director of Development
Loring M. Thompson, B.S., M.S., M.A., Ph.D.	Dean of Adult Programs

OFFICERS OF GENERAL ACADEMIC ADMINISTRATION

William C. White, B.S., Ed.M., Eng.D.	Provost
Lawrence A. Allen, B.S., M.S., Ph.D.	Dean of University College
Geoffrey Crofts, B.Comm., F.S.A.	Dean and Director of the Graduate School of Actuarial Science
Martin W. Essigmann, S.B., M.S.	Dean of Research
Albert E. Everett, B.S., M.B.A., D.C.S.	Dean of Continuing Education
Gilbert C. Garland, B.S., Ed.M., Ed.D.	Dean and Director of Admissions
Roger S. Hamilton, A.B., M.A., Ph.D.	Dean of Business Administration
Arnold E. Hanson, Ph.B., Ph.M., Ph.D.	Dean of Instruction, Suburban Campus
Charles W. Havice, A.B., M.A., S.T.B., Ph.D., D.D.	Dean of Chapel
LeRoy C. Keagle, B.S., Ph.D.	Dean of Pharmacy
Wilfred S. Lake, A.B., M.A., Ph.D.	Dean of Liberal Arts
Gilbert G. MacDonald, B.I.E., Ed.M.	Dean of Students
Donald H. MacKenzie, B.S., Ed.M.	Dean of Lincoln College
Roland H. Moody, A.B., B.L.S.	Director of University Library
Rudolph M. Morris, B.S., Ed.M.	Registrar of the Basic Colleges
Kenneth G. Ryder, A.B., M.A.	Dean of Administration of Day Undergraduate Programs
Ronald E. Scott, B.S., M.A., Sc.D.	Dean of Engineering
Loring M. Thompson, B.S., M.S., M.A., Ph.D.	Dean of Adult Programs
Lester S. Vander Werf, A.B., M.A., Ed.D.	Dean of Education
Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division
Charlotte E. Voss, B.S., M.S., Ed.D.	Dean of Nursing
Roy L. Wooldridge, B.S., Ed.M.	Dean and Director of Co-operative Education

THE GRADUATE DIVISION

Arthur A. Vernon, B.S., M.S., Ph.D. — Dean of the Graduate Division and Director of the Graduate School of Arts and Sciences

Bernard J. Brent, B.S., M.S., Ph.D. — Director of the Graduate School of Pharmaceutical Sciences

Geoffrey Crofts, B.Comm., F.S.A. — Dean and Director of the Graduate School of Actuarial Science

George W. Hankinson, A.B., S.B., M.S. — Director of the Graduate School of Engineering

Frank E. Marsh, Jr., A.B., Ed.M., Ed.D. — Director of the Graduate School of Education

Myron J. Spencer, A.B., M.A. — Director of the Graduate School of Business Administration

Paul A. Rodenhiser, B.S. — Administrative Assistant in the Graduate Division

Richard E. Sprague, B.S., B.B.A., M.B.A., Ed.M. — Administrative Assistant in the Graduate Division

Janice Walker, A.B. — Registrar of the Graduate Division

Aims and Scope of the University

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of more than one hundred and twenty-five distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Co-operative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), and Nursing (1964). This time-tested educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, actuarial science, and the pharmaceutical sciences.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. These programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day but who are desirous of broadening their educational background by part-time study. All formal courses of study leading to degrees through evening programs are approved by the appropriate Basic College faculties and are subject to the same quantitative and qualitative standards as the regular day curricula.

The following is a brief outline of the aims and scope of the University's programs.

11

I. THE EIGHT COLLEGES

1. THE COLLEGE OF LIBERAL ARTS

The College of Liberal Arts offers majors in the usual fields of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Co-operative Plan.

2. THE COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Co-operative Plan, which provides for employment in libraries, social service agencies, and school systems.

3. THE COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development which annually conducts an intensive program designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Co-operative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate co-operative students as research assistants.

4. THE COLLEGE OF ENGINEERING

The College of Engineering offers five-year co-operative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also

offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day co-operative curriculum, and meets the same qualitative and quantitative standards of scholarship.

5. THE COLLEGE OF PHARMACY

The College of Pharmacy offers five-year co-operative curricula leading to the degree of Bachelor of Science in Pharmacy. Co-operative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

6. THE COLLEGE OF NURSING

The College of Nursing offers a three-year program on the Co-operative Plan which qualifies students for the associate degree and prepares them for the R.N. Examinations. Three of Boston's leading hospitals—Beth Israel, Children's Hospital Medical Center, and the Massachusetts General Hospital—collaborate with Northeastern University by providing suitable co-operative work opportunities during the second and third years of the program. Graduates of the three-year program may continue toward the Bachelor of Science degree if they so desire.

7. UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other Colleges of the University, offers courses of study leading to certificates, associate degrees, or to the Bachelor of Science degree. University College offers both day and evening programs; the latter are designed specifically to meet the needs of older, more mature students who wish to undertake part-time curricula during late afternoon or evening hours and on Saturday mornings. In co-operation with the Forsyth School for Dental Hygiene, University College also offers a two-year day currculum leading to the Associate in Science degree.

Quality standards of instruction and requirements for the degrees offered by University College are wholly consistent with those of the other Colleges of the University. University College does not duplicate the offerings of the Colleges of Liberal Arts, Business Administration, Pharmacy, Education, Engineering, and Nursing, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adults desiring formal programs of professional development on a part-time basis, or of young people enrolled in professional schools affiliated with Northeastern University.

8. LINCOLN COLLEGE

Lincoln College offers evening programs of study in several fields of science and engineering technology leading to the degree of Associate in Science or Associate in Engineering. The courses of study are of college grade and cover much of the technological subject matter customarily included in schools of engineering, but the curricula are less extensive in scope than those required for the baccalaureate degree in engineering. They prepare students to work with professional engineers in various technical capacities.

II. THE GRADUATE DIVISION

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

ARTS AND SCIENCES

Master of Arts, Master of Science, Ph.D. in Physics and in Chemistry

BUSINESS

Master of Business Administration

EDUCATION

Master of Education

ENGINEERING

Master of Science with course specification, Ph.D. in the fields of Electrical and Chemical Engineering

ACTUARIAL SCIENCE

Master of Science in Actuarial Science

PHARMACEUTICAL SCIENCES

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology

Some of these programs are offered on the Co-operative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in the Graduate Center Building.

III. CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. Through the Bureau of Business and Industrial Training, the Center provides in-service programs, custom-built to meet specific needs of business and industrial enterprises, while the Division of Special Programs, working co-operatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

IV. AFFILIATED PROGRAMS

1. FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in co-operation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

2. FOR MEDICAL TECHNOLOGISTS

In co-operation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Co-operative Plan leading to the degree of Bachelor of Arts.

3. FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the Peter Bent Brigham, New England Deaconess, and Children's Hospital Medical Center Schools of Nursing.

V. RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are co-ordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction in the areas of art and sciences, business, engineering, pharmacy, nursing, and teacher education, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

Buildings and Facilities

Northeastern University is located on Huntington Avenue in the Back Bay section of Boston. The main administrative offices of the University are located in Richards Hall.

The chief railroad centers of Boston are the North and South Stations. To reach the University from the North Station, board an MTA subway car going to Park Street and transfer there to any Huntington Avenue car. To reach the University from South Station, board a Cambridge-bound subway train and transfer at Park Street to a Huntington Avenue car. The "Northeastern" station is the first stop outside the subway.

HUNTINGTON AVENUE CAMPUS

The principal educational buildings of Northeastern University are located on sixteen acres of a 42-acre site in the Back Bay section of Boston. Only one block to the west of the University lie the famous Boston Museum of Fine Arts and the beautiful public gardens-park reservation known as "The Fenway." A map of the Huntington Avenue Campus appears on page 2.

Following a long-range development plan, University facilities have expanded substantially in recent years. In addition to seven new buildings, all constructed within the past 25 years, several modernized older buildings are available for specialized uses. The newer buildings are interconnected by means of tunnels.

In addition to classrooms and instructional offices, the principal buildings include the following:

BOTOLPH BUILDING — Department of Civil Engineering

CABOT PHYSICAL EDUCATION CENTER — Gymnasium, Cage, Rifle Range

DODGE LIBRARY — Library, Engineering Drawing Rooms

ELL STUDENT CENTER — Student Activities, Chapel, Auditorium, University Commons

FORSYTH BUILDING — Department of Industrial Engineering, Mechanical Engineering Laboratories, Health Service

GRADUATE CENTER — Administrative Offices of the Graduate Division, Department of Natural Sciences, Physics Laboratories, Cafeteria

GREENLEAF BUILDING — ROTC Headquarters, Research Facilities

HAYDEN HALL — Offices of University College, Center for Continuing Education, Lincoln College, College of Business Administration, College of Education; Department of Electrical Engineering; Department of Art

MUGAR LIFE SCIENCES BUILDING — Colleges of Nursing and Pharmacy; Departments of Psychology, Biology, and Chemical Engineering

RICHARDS HALL — Administrative Offices, Chemistry and Mechanical Engineering Laboratories, Bookstore

SUBURBAN CAMPUS AT BURLINGTON — In order to meet the needs of individuals and of industry in the area, Northeastern University has established a Suburban Campus near the junction of Routes 128 and 3 in Burlington, Massachusetts.

In addition to graduate courses in engineering, physics, mathematics, business, science, education, and the arts, portions of undergraduate programs leading to the Associate and Bachelor of Science degrees, special programs for women and non-credit state-of-the-arts programs in the form of seminars, conferences, institutes, forums, and "released-time" programs are offered.

General Graduate Division Regulations

REGISTRATION

At the beginning of each semester all students must register in the Graduate Division office at the times specified in the calendar.

PROGRAM CLASSIFICATIONS

Students who have registered for a degree program in the Graduate Division are given a program classification in one of the curricula listed in the catalog. Students who are not pursuing a specific degree program are entered upon the Graduate Division records as unclassified.

RESIDENCE

All work for advanced degrees must be completed in residence at the University unless approval has been obtained from the Dean of the Graduate Division for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

PROGRAMS OF STUDY

At the time of his first registration, each full-time student must develop, with the assistance of his faculty advisor, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty advisor.

Evening part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per semester unless special permission to carry a heavier load is given by the director of the respective graduate school.

GRADING SYSTEM

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A. Excellent
   This grade is given to those students whose performance in the course has been of very high graduate caliber.

B. Satisfactory
   This grade is given to those students whose performance in the course has been at the level necessary for graduate credit.

C. Fair
   This grade is used to indicate that the student's performance in the course may be acceptable but is not consistently at the level expected in graduate work.

F. Failure
   This grade is used to indicate unsatisfactory work.

In addition, the following letter designations are used:

I. Incomplete, without quality designation. This is used when a student does not take the final examination or otherwise fails to complete the work of the course.

S. Satisfactory, without quality designation. This designation is used for thesis and seminar work.

W. Withdrawn without prejudice.

The designation "I" will be changed to a grade upon removal of the deficiencies which caused the grade of "I" to be reported. Such deficiencies must be removed within six weeks after the semester ends, or the grade of "I" will be changed to a grade of "F." If the deficiencies are due to a missed final examination, permission to take a make-up must be obtained from the director of the respective graduate school within two weeks following the date of the missed examination, and the examination must be made up at the time specified by the Graduate Division.

WITHDRAWALS

No withdrawal from a course is allowed after the tenth class session. Any student who, prior to the tenth class session, is absent from three class periods in succession without excuse will be dropped from the class.

The University provides all instruction and accommodations on an academic semester basis; therefore, no refunds are granted except in cases where students are compelled to withdraw because of personal illness or other reasons beyond their control. A student must complete an official withdrawal application at the Graduate Division office before being considered for a refund. In no case are refunds made after a student has attended the fifth session of a class. Questions regarding refunds should be discussed with the Bursar's office.

CLASS HOURS AND CREDITS

All credits are entered as semester hours. The designation of a semester hour is the equivalent of one hour in class for sixteen weeks. Some classes meet in the regular day hours on a semester basis and courses for the co-operative program meet on the ten-week schedule. In the summer sessions, classes meet for 6- or 8-week periods, depending upon the graduate program. The academic calendar for each graduate school should be consulted in order to determine the opening and closing dates of the session.

INTERVIEW AND REGISTRATION DATES, OFFICE HOURS, AND CLASS SCHEDULES

For dates of the interview and registration periods and office hours, consult the various calendar pages. The registration circulars issued in July, December, and May provide information regarding class meeting times and teaching staff as well as list the course offerings for the first semester, second semester, and summer session, respectively. Copies of these circulars may be obtained from the office of the Graduate Division, Northeastern University, Boston, Massachusetts 02115, or by calling 262-1100.

THE MASTER'S DEGREE

Northeastern University offers programs leading to the degrees of Master of Science, Master of Arts, Master of Business Administration and Master of Education.

The Master of Science degree may be earned in the following fields: actuarial science, biology, chemical engineering, chemistry, civil engineering, electrical engineering, engineering management, mathematics, mechanical engineering, and physics.

The Master of Arts degree may be earned in the following fields: English, history, political science, psychology, and sociology.

ADMISSION

Admission to the Graduate Division is granted to graduates of recognized colleges, universities, or institutes of technology who present satisfactory evidence of ability to pursue graduate study with profit. Specific admission requirements for departments offering graduate work will be found in the sections describing the work of each department.

Applications for admission to the full-time graduate programs, together with letters of recommendation and transcripts of prior college training must be filed by March 15 in the year in which the graduate work is to be started unless other filing dates are indicated by the respective graduate schools. Applications may be obtained by writing to the Office of the Graduate Division. In some fields, certain entrance examinations are required and, therefore, the admission requirements for each program should be examined.

For admission to any part-time program, a personal interview with the director of the appropriate graduate school or the head of a department is required. Transcripts of the applicant's prior college training should be presented at that time. If this is not possible, such material must be filed within six weeks after registration or the student will be asked to withdraw.

ACADEMIC CLASSIFICATIONS

After review of an applicant's transcript of undergraduate work, students are given an academic classification as regular or special. Those who have a bachelor's degree from an accredited program with acceptable quality of undergraduate work are classified as regular. Those who have an undergraduate record which is not acceptable for regular classification are classified as special. Special students must obtain a B average in the first 12 semester hours of credit work for which they register in order to continue in the Graduate Division. Students whose records are not satisfactory may be dropped prior to the completion of this amount of work. When special students obtain a B average in the first 12 semester hours of credit work, they will be classified as regular students. The Graduate Division requirements apply to both classified and unclassified students.

GENERAL REQUIREMENTS

A candidate for the master's degree must complete satisfactorily an approved program conforming to the requirements of the department or graduate school in which he is registered.

The requirements for the master's degree are a minimum of thirty semester hours of correlated work of graduate caliber, together with such other study as may be required by the department or graduate school concerned. Department chairmen and the directors of the graduate school are available for counsel on the selection of electives.

ACADEMIC REQUIREMENTS

In order to qualify for the master's degree, an average of not less than B must be obtained in the graduate courses required for the degree as specified for each program. If a grade of F is obtained in a required course, this course must be repeated with a passing grade. If a grade of C is obtained on a required course, this course may be repeated once only. If a grade of F is obtained in an elective course, this course may be either repeated with a passing grade or another elective course may be substituted for it. In order to satisfy the requirements of completed required courses or to obtain a B average in the necessary work, a maximum of two extra courses will be allowed.

COMPREHENSIVE EXAMINATION

At the discretion of the department, a final written or oral comprehensive examination may be required. No candidate may present himself for the final comprehensive examination without the permission of his faculty advisor. Such examinations must be taken at least two weeks before the commencement at which he expects to receive his degree.

THESIS

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material. The thesis should show evidence that the student has a thorough acquaintance with the literature of a limited field and must meet the approval of the department or graduate school concerned.

Instruction concerning the details of preparation of the thesis may be obtained from the Graduate Division office.

FOREIGN LANGUAGE REQUIREMENT

Some departments require an examination to show evidence of ability to read one or more foreign languages. This reading knowledge is established by an examination arranged by the department concerned.

TRANSFER CREDITS

After a student has been accepted for graduate study toward the master's degree he may submit a request for transfer credit. A maximum of 8 semester hours of graduate credit may be accepted toward a master's degree if such work is approved by the director of the respective graduate school or the Departmental Graduate Study Committee. Transfer credit will be considered only if the work is consonant with the objectives of the graduate program and if the grades in the courses are A or B.

TIME LIMITATIONS

Course credits earned in the program of graduate study are valid for a maximum period of eight years. This time limitation is likewise applicable to any accepted transfer credits.

THE DOCTOR'S DEGREE

Northeastern University offers programs leading to the degree of Doctor of Philosophy in the following fields: chemical engineering, electrical engineering, chemistry, and physics.

The degree is awarded to candidates who give evidence of proficiency, high attainment, and research ability in their major field and who have satisfied the specific requirements of the department in which they are enrolled.

GENERAL REQUIREMENTS

A minimum of thirty semester hours of graduate course work is required for students studying for the doctoral degree. The amount above this is specified for each candidate by the departmental graduate committee. The other requirements include a qualifying examination, completion of the residence requirement, a comprehensive examination, demonstration of foreign lan-

guage proficiency, completion of an approved thesis, and a final oral examination. It is the responsibility of departmental graduate committees to certify to the Graduate Division the completion of each requirement.

QUALIFYING EXAMINATION

In order to become a doctoral degree candidate, each student must pass a qualifying examination. This examination may be either written or oral or both at the discretion of the department.

DEGREE CANDIDACY

After thirty semester hours of graduate work have been taken with satisfactory grades and after successful completion of the qualifying examination, a student is established as a degree candidate.

RESIDENCE REQUIREMENT

Candidates for the doctoral degree must spend the equivalent of at least one academic year in residence at the University taking graduate work and/or working on a thesis. The period of residence starts after the degree candidacy has been established and must be continuous; however, the residency need not be on a full-time basis.

COMPREHENSIVE EXAMINATION

During the time in which a student is a candidate for a doctoral degree he must demonstrate by means of a comprehensive examination, a subject matter knowledge satisfactory for the award of such degree.

COURSE REQUIREMENT

The course requirements, in addition to the minimum requirement of thirty semester hours' credit, are established by the departmental graduate committee for each candidate.

THESIS

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes material suitable for publication. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the theoretical and/or experimental results of the research. The original bound copy of the thesis will be retained by the library. Northeastern University reserves publication rights to the material presented in the thesis.

FOREIGN LANGUAGE

Before a candidate may take the final oral examination, he must demonstrate a foreign language proficiency as required by the department. This reading knowledge is established by the examination administered by the department in which the candidate is registered.

FINAL ORAL EXAMINATION

The final oral examination will be taken after completion of all other requirements for the degree. This examination cannot be held until after the thesis has been received in the Graduate Division office and must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the departmental graduate committee, and the Dean of the Graduate Division is notified of the time of the examination.

The final oral examination will include the subject matter of the doctoral thesis and significant developments in the field of the thesis work. Other fields may be included if recommended by the examining committee.

TRANSFER CREDIT

The first thirty semester hours of graduate work which a student takes comprise the basic requirements for the master's degree, and eight semester hours of acceptable work are allowed as transfer credit for this work. The graduate course work which a student must take beyond the basic thirty semester hours is established by each departmental graduate committee and if transfer credit is desired for any of this work, approval of the departmental graduate committee must be obtained. In general, no more than one half of the course work required beyond the basic thirty credits will be accepted for transfer credit.

TIME LIMITATION

After admission to degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements.

REGISTRATION

The program of each student must be approved by his advisor before registering in the Graduate Division office.

CLASSIFICATION OF DOCTORAL CANDIDATES

1. Students who have completed thirty semester hours of graduate work, and have been accepted by the department for doctoral study, but who have not yet passed the qualifying examination are classed as Predoctoral students.

2. Students who have completed thirty semester hours of graduate work and who have passed the qualifying examination are classed as Doctoral students.

Tuition and Fees

The policies governing the amount and the regulations pertaining to the payment of tuition and fees are established by the Executive Council of Northeastern University. The Council reserves the right to change these regulations at any time. Such changes will apply to students currently enrolled as well as new applicants for admission.

TUITION FOR CO-OPERATIVE PROGRAMS

Graduate School of Actuarial Science	$400 per term
Graduate School of Arts and Sciences	$375 per term
Graduate School of Engineering	$375 per term
Graduate School of Pharmacy	$400 per term

TUITION FOR OTHER GRADUATE PROGRAMS

Graduate Schools of Arts and Sciences, Business Administration and Engineering

Courses on Huntington Avenue Campus	$37.50 per sem. hr.
Courses on Burlington Campus	$42.50 per sem. hr.
Graduate School of Education	$25.00 per sem. hr.
Field Experience in Guidance	$ 75.00
Student Teaching	$100.00

REGISTRATION FEE . . . . $ 10.00

Payable at time of first registration in all graduate schools except for non-degree students in the Graduate School of Education

LATE PAYMENT FEE . . . . $ 2.00

For failure to pay tuition on due date

MAKE-UP FEE . . . . $ 5.00

GRADUATION FEE . . . . $ 20.00

Payable on or before May 1 of the year in which the graduate degree is to be awarded

PAYMENTS

Tuition statements will be mailed to the students by the Student Accounts office and are payable on or before the date specified. Checks should be drawn payable to "Northeastern University."

FELLOWSHIPS

Northeastern University has available fellowships and assistantships for students who are engaged in graduate work. The Graduate Division will send candidates the proper application blanks upon request.

TEACHING FELLOWSHIPS

A number of half-time teaching fellowships are available in the Departments of Biology, Chemistry, English, History, Physics, Political Science, Psychology and Sociology. The time required for departmental assistance does not normally exceed eighteen hours a week for two semesters. Teaching fellowships carry remission of tuition.

TUITION FELLOWSHIPS

Some departments have available tuition fellowships which cover eight semester hours of graduate work per semester. In return students will be required to assist in the department on the average of three hours per week. These fellowships are normally given to students who are in the first year of graduate work.

RESEARCH FELLOWSHIPS

Some departments employ graduate students on research projects. These fellowships carry remission of tuition for nine semester hours of academic work; stipends are comparable to those for teaching fellowships. These fellowships are normally given to students who are in the first or second year of graduate work.

DOCTORAL RESEARCH FELLOWSHIPS

In the departments which give work leading to the Ph.D. degree, research fellowships are available for students who have passed the qualifying examination and established candidacy for the Ph.D. degree. These fellowships carry remission of tuition, and the stipend is higher than that for the Research Fellowships.

GRADUATE CO-OPERATIVE TEACHING ASSISTANTSHIPS

Some engineering departments have graduate co-operative teaching assistantships available for students studying for the master's degree on the

Co-operative Plan. Holders of these assistantships alternate periods of academic work with periods of assistance in the department according to the co-operative calendar. Remission of tuition is given in addition to the compensation for the assistantship.

GRADUATE CO-OPERATIVE RESEARCH ASSISTANTSHIPS

Some engineering departments have graduate co-operative research assistantships available for students studying for the master's degree on the Co-operative Plan. Holders of such assistantships alternate full-time research work with academic work according to the co-operative calendar. Remission of tuition is given in addition to the compensation for the assistantship.

APPOINTMENTS

Appointments to fellowships and assistantships are ordinarily announced by April 1 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed.

FULL-TIME DUTIES

Graduate students who hold teaching fellowships, research fellowships, graduate co-operative teaching assistantships, or graduate co-operative research assistantships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty advisor and the Dean of the Graduate Division.

Graduate School
of
Actuarial Science

ACTUARIAL SCIENCE PROGRAM

This graduate program is offered exclusively on the Co-operative Plan, under which a student attends classes at Northeastern for two ten-week terms during each of two school years. The subject matter of the courses is intimately associated with that underlying Parts 3-6, inclusive, of the examinations of the Society of Actuaries. The classes of instruction over the two-year period provide thorough preparation for the passing of these Parts in order.

Successful completion of the four School terms, independently of the results of the professional examinations, will earn the degree of Master of Science in Actuarial Science.

Each of the four ten-week terms over the two-year period will be scheduled so as to close on the Friday preceding the week of the Society Examinations held in November and May. The dates for the 1964-1965 academic year will be August 24, 1964 to October 30, 1964 for the First Term, and March 1, 1965 to May 7, 1965 for the Second Term. Unlike the regular Co-operative plan, the actuarial science program will operate on a one-divisional basis only and not by Co-operative pairs. The number of enrolled students is not limited.

Actuarial Internships are made available by Northeastern through grants of co-operating companies in amounts providing for tuitions and other fees, and allowances for the students to assist in meeting incidental expenses incurred during the School terms. Complete information concerning the amounts of the Internships will be furnished to employers upon request. The University will assist an applicant in securing co-operative employment if he is in all other respects qualified for admission to the School.

Applications for the actuarial science program with all required supporting data should be filed as soon as possible after January 15, but no later than May 1 of the year in which enrollment in classes commencing the next following August is desired. However, cancellation of the application may thereafter be made at any time following publication of the results of the May examinations of the Society of Actuaries and prior to August 1, if, in the judgment of the co-operating employer and the University, the results thereof should warrant such action.

The Dean and Director of the Graduate School of Actuarial Science is Mr. Geoffrey Crofts, F.S.A., who will join the faculty in the late Spring, 1964. Until Mr. Crofts' appointment takes effect, Mr. Harold A. Garabedian, F.S.A., is serving as Acting Director.

ACTUARIAL SCIENCE PROGRAM

ADMISSION

To be enrolled for graduate work in actuarial science, applicants must have obtained a bachelor's degree from a recognized institution in an undergraduate program which included at least two semesters of calculus and a semester each of probability and statistics, with grades evidencing a strong potential for success with Part 1 (General Mathematics) and Part 2 (Probability and Statistics) of the examinations of the Society of Actuaries.

If the applicant has written any of the Society examinations, the above requirement would best be satisfied by successful completion of Parts 1 and 2. If either or both of these parts has been failed narrowly, the applicant will still be considered as admissible if it appears that he can meet the commitments of the program.

Credit for Part 1 of the Actuarial Examinations will be granted by the Society of Actuaries if a candidate has passed the Advanced Mathematics Test of the Graduate Record Examinations with a score equivalent to the passing score for the Society examinations.

Applicants who have already passed the first three or more parts of the Society of Actuaries' Examinations will be considered for admission under special conditions. Applicants who have passed Parts 1-3 (inclusive) may be admitted, subject to other regular requirements, at the start of the second term. Credit toward the master's degree will be granted for the work of the first term if the applicant sits for and passes a special qualifying examination of the School in the subject matter covered during the first term. An introduction to life contingencies is included in this subject matter. In all other situations, an application for admission to the School for less than four terms may be approved, subject to regular requirements, but in no case will the student be granted credit toward a degree.

Since the program operates exclusively on the Co-operative Plan, employment with a Co-operating company is a requirement for admission. Satisfactory performance during work periods must be maintained.

To receive the degree of Master of Science in Actuarial Science, students must complete the required courses, (subject to the exception set forth in the fourth paragraph above), carrying a total of 30 semester hours of credit with an average grade of B or better. There are no elective courses.

ACTUARIAL SCIENCE PROGRAM

Required Courses

FIRST YEAR
  FIRST TERM

	CREDITS (Semester Hours)
Finite Differences	3
Compound Interest and Annuities-Certain	3
Introduction to Life Contingencies	2

SECOND TERM

Life Contingencies, including Multiple Decrement Functions	8

SECOND YEAR

THIRD TERM

Demography

Principles Underlying the Construction of Mortality and Other Tables	3
Elements of Graduation of Mortality Tables and Other Series	2
The Sources and Characteristics of the Principal Mortality and Other Tables and of the Principal Mortality and Disability Investigations	2

FOURTH TERM

General Accounting—Actuarial Aspects of Life Insurance Accounting	3
Valuation of Liabilities	2
Principles of Investment—Investment of Life Insurance Funds	2

Total 30

*Graduate School
of
Arts and Sciences*

ARTS AND SCIENCES PROGRAMS

The curricula of the degree programs are given under each departmental heading. The descriptions of courses offered by the several departments are given so that prospective students may obtain a view of the course coverage. Preparation courses are indicated in each instance. Not all courses are offered every year, but the course offerings will be arranged in such a manner that students may make continuous progress toward the degree.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level, and the University reserves the right to cancel any course for which an insufficient number of students apply.

Teaching fellowships are available in the departments of biology, chemistry, English, history, physics, political science, psychology, and sociology. Applications for these programs must be filed by March 15 with all supporting data as required by the Graduate School. The programs for such students must have the approval of the departmental advisor before the student registers with the Graduate School.

The graduate program in mathematics operates on the Co-operative Plan by which a student, during each of two school years, has two ten-week terms of classes at Northeastern University. During the first year this is supplemented by a ten-week and twenty-two week summer term of Co-operative work with his employer. The second year the student has two ten-week terms of Co-operative employment. Two students may form a Co-operative pair, alternating their classroom study with their employment periods, although arrangements for one student can easily be made. The University Department of Co-operative Education will arrange for the employment of the graduate students.

Applications for this program in mathematics should be filed as soon after January 15 as possible with all supporting data as required by the Graduate School. The curriculum of this program is given under the departmental headings.

The curricula of the evening part-time programs are specified by the departments. All part-time students must register in the Graduate School and present a transcript of undergraduate record at that time.

A circular describing the courses to be offered during the first semester and giving the registration and interview dates is issued in July. A similar circular for the second semester is issued in December, and for the summer session one is issued in May.

ACADEMIC CALENDAR

PROGRAMS IN
BIOLOGY, CHEMISTRY, AND PHYSICS
PART-TIME PROGRAM IN MATHEMATICS

May 1964—June 1965

Summer Session 1964

Interview and Registration Period	Monday-Friday	May 18-May 29
Memorial Day, Office Closed	Saturday	May 30
Classes Begin	Monday	June 1
Independence Day, Office Closed	Saturday	July 4
Classes End	Tuesday	July 21
Examination Period	Wednesday-Thursday	July 22-July 23

First Semester 1964-1965

Registration Period for Former Students	Monday-Saturday	July 6-Sept. 12
Interview and Registration Period for New Students	Monday-Saturday	Aug. 17-Sept. 12
Labor Day, Office Closed	Monday	Sept. 7
Classes Begin	Monday	Sept. 14
Columbus Day, No Classes	Monday	Oct. 12
Veterans' Day, No Classes	Wednesday	Nov. 11
Thanksgiving Vacation	One Week	Nov. 23-Nov. 28
Classes Resume	Monday	Nov. 30
Christmas Vacation	Two Weeks	Dec. 21-Jan. 1
Classes Resume	Monday	Jan. 4
Classes End	Friday	Jan. 15
Examination Period	Monday-Friday	Jan. 18-Jan. 22
No Classes	Monday-Friday	Jan. 25-Jan. 29

Second Semester 1964-1965

Registration Period for Former Students	Monday-Saturday	Jan. 4-Jan. 30
Interview and Registration Period for New Students	Monday-Saturday	Jan. 11-Jan. 30
Classes Begin	Monday	Feb. 1
Washington's Birthday, No Classes	Monday	Feb. 22
Patriots' Day, No Classes	Monday	April 19
Classes End	Friday	May 14
No Classes	One Week	May 17-May 21
Examination Period	Monday-Friday	May 24-May 28

ACADEMIC CALENDAR

PROGRAMS IN
ENGLISH, HISTORY, POLITICAL SCIENCE, PSYCHOLOGY, AND SOCIOLOGY

July 1964—June 1965

First Semester 1964-1965

Registration Period for Former Students	Monday-Saturday	July 6-Sept. 19
Interview and Registration Period for New Students	Wednesday-Saturday	Aug. 31-Sept. 19
Labor Day, Office Closed	Monday	Sept. 7
Classes Begin	Monday	Sept. 21
Columbus Day, No Classes	Monday	Oct. 12
Veterans' Day, No Classes	Wednesday	Nov. 11
Thanksgiving Vacation	One Week	Nov. 23-Nov. 28
Classes Resume	Monday	Nov. 30
Christmas Vacation	Two Weeks	Dec. 21-Jan. 2
Classes Resume	Monday	Jan. 4
Classes End	Friday	Jan. 22
Examination Period	Monday-Friday	Jan. 25-Jan. 30
No Classes	Monday-Friday	Feb. 1-Feb. 6

Second Semester 1964-1965

Registration Period for Former Students	Monday-Saturday	Jan. 4-Feb. 6
Interview and Registration Period for New Students	Monday-Saturday	Jan. 18-Feb. 6
Classes Begin	Monday	Feb. 8
Washington's Birthday, No Classes	Monday	Feb. 22
Spring Vacation	One Week	Apr. 19-Apr. 24
Classes End	Saturday	May 29
Memorial Day, Office Closed	Monday	May 31
Examination Period	Monday-Friday	June 1-June 5

ACADEMIC CALENDAR

CO-OPERATIVE PROGRAM IN MATHEMATICS

July 1964-July 1965

Registration for both Division A and B First and Second Year Students	Monday-Friday	July 13-Sept. 11
Labor Day, Office Closed	Monday	Sept. 7
Classes Begin for Division A Students	Monday	Sept. 14
Columbus Day, No Classes	Monday	Oct. 12
Veterans' Day, No Classes	Wednesday	Nov. 11
Final Examination Period for all Division A Students	Monday-Friday	Nov. 16-Nov. 20
Classes Begin for Division B Students	Monday	Nov. 23
Thanksgiving, No Classes	Thursday-Friday	Nov. 26-27
Classes End at 5 p.m. for Christmas Holiday	Tuesday	Dec. 22
Classes Resume after Holiday at 9 a.m.	Monday	Dec. 28
New Year's Day, No Classes	Friday	Jan. 1
Final Examination Period for All Division B Students	Monday-Friday	Jan. 25-Jan. 29
Registration for Division A and Division B Students	Monday-Friday	Jan. 4-Jan. 29
Second Term Classes Begin for Division A Students	Monday	Feb. 1
Classes End at 5 p.m. for Washington's Birthday Recess	Friday	Feb. 19
Classes Resume after Recess at 9 a.m.	Thursday	Feb. 25
Thesis Due for Second Year Division A Students	Monday	Mar. 22
Final Examination Period for all Division A Students	Monday-Friday	Apr. 5-Apr. 9
Second Term Classes Begin for Division B Students	Monday	Apr. 12
Patriots' Day, No Classes	Monday	Apr. 19
Memorial Day	Monday	May 31
Thesis Due for Second Year Division B Students	Tuesday	June 1
Final Examination Period for all Division B Students	Monday-Friday	June 7-June 11
Commencement	Sunday	June 20

COMMITTEE ON GRADUATE STUDY
IN
ARTS AND SCIENCES

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and Director of the Graduate School of Arts and Sciences

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Chairman of the Department

Reginald G. Lacount, S.B., M.A., Ph.D.   Professor of Physics
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and Chairman of the Department

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Dean of Administration of Day Undergraduate Programs

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and Chairman of the Department

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  Assistant Professor of Physics

Kurt Arbenz
  Lecturer in Mathematics

Petros N. Argyres
  Lecturer in Physics

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  Professor of Physics

Philip N. Backstrom
  Assistant Professor of History

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  Professor of Political Science

James T. Barrs
  Professor of English

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  Assistant Professor of English

Wallace P. Bishop
  Associate Professor of History

Walton B. Bishop
  Lecturer in Mathematics

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  Associate Professor of
  Political Science

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Assistant Professor of History

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Neal T. Watson
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Lecturer in Physics

Steve Worth
Associate Professor of
Political Science

Samuel Zahl
Lecturer in Mathematics

Harold S. Zamansky
Associate Professor of Psychology

Biology

MASTER OF SCIENCE DEGREE

Admission

To be enrolled for graduate work in biology leading to the Master of Science degree, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least fifteen semester hours of chemistry and biology courses. In particular, this work must include a course in general biology, or a course in botany and one in general zoology, a course in comparative anatomy, a course in embryology, one year of general chemistry, one year of organic chemistry, and one year of physics.

Program

The program is for full-time students or those holding some type of fellowship appointment in the department. Thirty semester hours of academic work are required. All students must take 10.101 Environmental Dynamics. The balance of the program will be made up from courses approved by the faculty advisor. With the approval of the departmental graduate committee, a thesis may be elected for six semester hour credits.

With the approval of the faculty advisor, a maximum of eight semester hour credits may be taken from advanced undergraduate courses in Biology and a maximum of eight semester hour credits from advanced undergraduate courses in other departments.

MASTER OF SCIENCE IN HEALTH SCIENCES DEGREE
Evening Part-Time Program

Admission

To be enrolled for graduate work in biology leading to the degree of Master of Science in Health Sciences, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least fifteen semester hours of science courses. In particular, this work must include a course in general biology or a course in botany and one in general zoology, one year of general chemistry, and one year of organic chemistry.

Program

The program leading to the degree of Master of Science in Health Sciences is designed for evening part-time students who may progress according to their abilities and time available. Thirty semester hour credits of academic work are required. The requirements may be met by taking the courses at the time at which they are offered. Courses in Medical Microbiology and Environmental Microbiology which are offered by University College of Northeastern University may be taken for credit toward the degree program. With the approval of the departmental graduate committee, a thesis may be elected for six semester hour credits.

DESCRIPTION OF COURSES

All courses carry four semester hours of credit except seminar and research.

10.101   Environmental Dynamics   Prep. Admission to graduate program
The chemical, physical, and biotic factors influencing plant and animal community.

10.103   The Lower Invertebrates
Taxonomy, morphology, embryology and life-histories of the acoelomate phyla.

10.104   The Coelomate Invertebrates
Continuation of 10.103 through the coelomate phyla.

10.122   Serology—Immunology
Current concepts concerning specific and non-specific factors of resistance to microbial disease. Chemical and biological considerations of antigens and antibodies. Laboratory work includes agglutination, precipitin, and agar-diffusion tests. Quantitative approaches stressed.

10.124   Medical Mycology
The biology of organisms responsible for mycoses; chemical, epidemiological and histopathological topics and techniques.

10.125   Marine Microbiology
Morphological, physiological and ecological factors concerning marine micro-organisms. Taxonomic problems, microbial association, and general methodological approaches to the study of marine micro-organisms.

10.128   Parasitology
Symbiotic relationships of protozoans, mesozoans, flatworms, nematodes, acanthocephalans, and arthropods.

10.130   Cytology
Classical and modern techniques for the study of the cell.

10.145   Haematology
Blood and blood forming organs in normal and abnormal conditions. Chemistry, morphology and pathology.

Chemistry

Admission

To be enrolled for graduate work in chemistry, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least one year of general chemistry, analytical chemistry, organic chemistry and physical chemistry, two years of mathematics including one year of differential and integral calculus, and one year of physics. Additional work in mathematics and physics is desirable.

THE MASTER'S DEGREE
Full-time Program

Program

The normal full-time program consists of courses, seminars, research and a thesis thereon. Each student is required to take 11.501, Introduction to Research, and at least one course (2 credits) in each of the four major fields, Inorganic, Organic, Physical and Analytical Chemistry. No more than eight semester hours may be assigned to research. All students are required to attend Seminar in each semester of study. One semester hour of credit is awarded to a student for each semester in which he conducts a seminar.

Evening Part-Time Program

The admission requirements for this program are the same as for the full-time program, but students may progress according to their abilities and the time available.

Required Courses

11.111, 112	Advanced Inorganic Chemistry	. . . .	4
11.221, 222	Advanced Organic Chemistry	. . . .	4
11.331	Thermodynamics	. . . .	2
11.332	Atomic and Molecular Structure	. . . .	2
11.414	Instrumental Analysis I	. . . .	2
			14

Electives

Eight semester hours must be elected from chemistry courses, including at least one organic chemistry course. Eight semester hours may be elected from any courses in chemistry, mathematics, or physics for which the student has the necessary preparation.

THE DOCTOR'S DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Chemistry.

Students admitted to full-time study in chemistry are eligible to take the qualifying examination in accordance with the information given under the heading of Qualifying Examination.

Students enrolled in the evening part-time master's degree program, who wish to qualify for Ph.D. candidacy, may so indicate by petition to the Graduate Study Committee of the Chemistry Department. The petition should be a letter containing a timetable for the taking of qualifying examinations and a course plan for completing thirty semester hours of graduate study.

Qualifying Examination

The qualifying examination is given in four parts covering the material of organic, analytical, physical, and inorganic chemistry. These examinations are normally given in the fall, winter, and spring. A student may take any or all of the examinations in each set and may repeat a failed examination only once. All four parts of the examination must be taken by the end of the third semester of registration for graduate work, and all parts must be passed by the end of the fourth semester of registration for graduate work. The Departmental Graduate Committee may set other completion dates for students who have taken graduate work at some other institution or are not currently enrolled in the full-time program. For such students, the taking of the qualifying examination may not extend over more than thirteen months.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

Residence Requirement

After degree candidacy has been established, the residence requirement is satisfied after one year of full-time graduate work or two years of half-time graduate work; however, it should be expected that at least two years of full-time work after establishment of degree candidacy will be necessary to complete the doctoral degree requirements. If students hold teaching fellowships which occupy one half of their time, their residence requirement is being discharged at half rate. No other part-time arrangements are permitted. If a candidate has a research fellowship which supports his research for the doctoral thesis, his residence requirement is discharged at a full rate.

Comprehensive Examination

The comprehensive examination requirement is composed of a series of short written examinations in a candidate's field of specialization. These are offered at a frequency of about one per month and are designed to test the candidate's familiarity with the current research frontiers of his specialty.

Within two years after degree candidacy has been established, a student must have passed seven of these examinations before he fails seven.

Course Requirements

A candidate is normally required by his faculty advisor to do some course work beyond the 30-hour minimum. The number and nature of these courses is individually determined for each candidate.

Thesis

In most cases, arrangements for a thesis advisor may have been established before the completion of the qualifying examinations. If not, such arrangements must be made as soon as possible after degree candidacy has been established. Depending upon the nature of a project, a thesis committee will be kept informed of the progress of the thesis and will approve the thesis in its final form.

Language Requirement

Proficiency must be demonstrated in two foreign languages as specified by the departmental graduate committee in accordance with the general Graduate Division regulations. French, German, and Russian are the acceptable foreign languages. Normally, proficiency is demonstrated by taking examinations administered by the Chemistry Department.

Final Oral Examination

This examination will be held in accordance with the Graduate Division regulations.

DESCRIPTION OF COURSES

All courses carry two semester hours of credit except seminar and research.

11.111   Advanced Inorganic Chemistry   Prep. One year of physical chemistry and one year of inorganic chemistry
Characteristics of atoms and molecules based on their electronic structure and the periodic classification of elements. Structure and symmetry of crystals. Electrostatic complexes. Advanced chemistry of non-metals.   (Offered yearly, 1st semester)

11.112   Advanced Inorganic Chemistry   Prep. 11.111 Advanced
                                                    Inorganic Chemistry
Advanced treatment of the chemistry of metals, chemical properties of
the solid state, recent developments in the field of coordination com-
anisms and stereochemistry of inorganic reactions. The significance of
nuclear properties, nuclear changes, and tracer studies in inorganic
chemistry is an integral part of the course.

(Offered yearly, 2nd semester)

11.113   Coordination Chemistry   Prep. 11.112 Advanced
                                              Inorganic Chemistry
Coordination compounds; their experimental detection, calculation of
stability constants, factors affecting solubility and stability constants.
Ligand field theory. Acidity, color, and lability of complexes. Kinetic and
stereochemical studies of inorganic reaction mechanisms.

(Offered 1964-65, 2nd semester)

11.115   Radiochemistry   Prep. 11.411 Advanced Analytical Chemistry
                              and 11.112 Advanced Inorganic Chemistry
Interactions of matter with high-energy radiation. The use of radio-
activity as an analytical tool in chemical research. Introduction to
isotope technology.   (Offered 1964-65, 1st semester)

11.150-11.199   Special Topics in Inorganic Chemistry
                  Prep. 11-111 and 11-112 Advanced Inorganic Chemistry
Selected topics of current importance in inorganic chemistry such as
non-stoichiometric compounds, geochemistry, fused salt chemistry, ion-
exchange resins, chemistry of transition elements.

(Offered 1965-66, 1st semester)

11.221   Advanced Organic Chemistry   Prep. One and one-half years
                                            of organic chemistry
An intensive survey of organic reactions. Modern concepts of structure
and mechanism are used to correlate factual material, but the em-
phasis is on practical syntheses and reactions of organic compounds.

(Offered yearly, 1st semester)

11.222   Advanced Organic Chemistry   Prep. 11.221 Advanced
                                                  Organic Chemistry
A continuation of 11.221.   (Offered yearly, 2nd semester)

11.233   Theoretical Organic Chemistry   Prep. 11.222 Advanced
                                                     Organic Chemistry
Inductive, resonance and steric effects on reactivity and properties of
organic molecules. Theory of organic acids and bases. Introduction to
the study of organic reaction mechanisms.

(Offered yearly 1st semester)

11.237   Stereochemistry   Prep. 11.222 Advanced Organic Chemistry
Geometrical and optical isomerism in organic compounds. Conformational
analysis.   (Offered 1964-65, 1st semester)

11.238   Physical Techniques in Organic Chemistry   Prep. 11.237
                    Stereochemistry and 11.233 Theoretical Organic Chemistry
Correlation of structures of organic compounds with their physical
properties: gross physical properties, dipole moments, absorption and
Rama spectra, electron and X-ray diffraction, nuclear magnetic reso-
nance, optical rotatory dispersion, mass spectrometry.
                                          (Offered 1964-65, 2nd semester)

11.240   Mechanisms of Organic Reactions   Prep. 11.237
                    Stereochemistry and 11.233 Theoretical Organic Chemistry
Consideration of the fundamental factors influencing the course of a
chemical reaction. Study of the effects of structural and environmental
changes on mechanisms of organic reactions.
                                          (Offered 1964-65, 2nd semester)

11.250-11.299   Special Topics in Organic Chemistry   Prep. 11.222
                                            Advanced Organic Chemistry
Selected topics of current importance in organic chemistry, such as
steroids, heterocyclic compounds, aliphatic nitrogen compounds and
fluorine compounds.   (Offered 1965-66, 2nd semester)

11.331   Thermodynamics   Prep. One year of physical chemistry
First law of thermodynamics, thermochemistry second law, chemical
equilibrium, solutions.   (Offered yearly, 1st semester)

11.332   Atomic and Molecular Structure   Prep. One year of
                                                    physical chemistry
Atomic spectra, atomic structure, introduction to wave mechanics, struc-
ture of matter, nature of the chemical bond.
                                          (Offered yearly, 2nd semester)

11.333   Chemical Kinetics   Prep. 11.335 Advanced Physical Chemistry
Transition state and collision theories of chemical reactions. Reaction
velocity in gaseous and liquid systems. Catalysis, chain reactions.
                                          (Offered 1964-65, 1st semester)

11.335   Advanced Physical Chemistry   Prep. 11.331 Thermodynamics
Introduction to statistical thermodynamics. Applications to chemical
kinetics and solutions of electrolytes.   (Offered yearly, 2nd semester)

11.337   Quantum Chemistry I   Prep. 11.332 Atomic and
                                                Molecular Structure
Classical mechanics. Formulation of the Schrodinger equation. Approxi-
mation methods. Application to structure of atoms.
                                          (Offered 1965-66, 1st semester)

11.338 Statistical Mechanics   Prep. 11.335 Advanced
                                                    Physical Chemistry
Ensembles. Systems of independent particles. Systems of interacting particles. Lattice statistics. Statistical thermodynamics. Quantum statistics. Applications to gases, liquids, solids, and solutions.
                                        (Offered 1965-66, 2nd semester)

11.339 Quantum Chemistry II   Prep. 11.337 Quantum Chemistry I
Applications of quantum mechanics to molecular systems on the more advanced level. Group theoretic methods. Applications to valence theory and spectroscopy.   (Offered 1965-66, 2nd semester)

11.341 Principles of Electrochemistry   Prep. One year of
                                                      physical chemistry
Fundamental principles of electrochemistry and important aspects of the theories of solutions. Application of electromotive force to chemical systems including fused salts. A comprehensive survey of electrochemical methods will be made.   (Offered 1964-65, 1st semester)

11.343 Colloid Chemistry   Prep. 11.331 Thermodynamics
Physical chemistry of surfaces and colloidal systems, pertaining to adsorption, diffusion, sedimentation, rheology and light scattering.
                                        (Offered 1965-66, 1st semester)

11.350-11.399 Special Topics in Physical Chemistry
                                Prep: One year of physical chemistry
Selected topics of current importance in physical chemistry.
                                        (Offered 1964-65, 2nd semester)

11.411 Advanced Analytical Chemistry
                                Prep. Admission to graduate program
The theory and practice of modern analytical techniques, with emphasis on separations such as distillation, liquid-liquid extraction, gas chromatography, and ion-exchange. Other new techniques such as non-aqueous titrations will be discussed.   (Offered yearly, 1st semester)

11.414 Instrumental Analysis I   Prep. Admission to graduate program
The theory and practice of traditional techniques of optical and electrometric methods of chemical analysis. Topics will include absolute measurements and endpoint detection systems. Absorption and emission spectroscopy as well as potentiometric, conductimetric, and voltametric methods will be discussed.   (Offered yearly, 2nd semester)

11.415 Instrumental Analysis II   Prep. 11.414 Instrumental Analysis I,
                                or consent of the instructor
The theory of measurements applied to analytical chemistry. The problem of instrument design and modification for specific applications will be

discussed. Topics will also include analytical problems of automated systems, process control, and continuous analytical monitoring. Data interpretation and data handling for recently developed instrumental techniques will be considered. (Offered yearly, 1st semester)

11.450-11.499 Special Topics in Analytical Chemistry
Prep. 11.411 Advanced Analytical Chemistry
and consent of the instructor
Selected topics of current importance in analytical chemistry.
(Offered yearly, 2nd semester)

11.501 Introduction to Research Prep. Admission to the graduate program
Lectures by members of the chemistry faculty on methods and techniques of research. Brief experimental problems to introduce specialized research techniques. (Offered yearly, 1st semester)

11.507-11.514 Seminar
Reports on current fields of investigation. (Offered yearly)

11.515-516 Research Prep. 11.501 Introduction to Research
Original research and a written dissertation thereon. (Offered yearly)

11.517-11.520 Research Prep. Admission to the doctoral program
Original research and a written dissertation thereon. (Offered yearly)

11.611 Polymer Chemistry I Prep. Organic and Physical Chemistry
Description and classification of polymerization reactions. Condensation and addition polymerizations. Anionic, cationic and radical polymerization including solution, emulsion and copolymerization. Discussion of commercial polymers where applicable. Kinetics of polymerization. Effects of monomer and polymer structure. Reactions of polymers. Introduction to the mechanical properties of polymers. Solution properties of polymers and molecular weight methods. (Offered yearly, 1st semester)

11.612 Polymer Chemistry II Prep. 11.611 Polymer Chemistry I
Degradation of polymers. Elaboration upon fundamental industrial problems such as adhesion, coating of clear and pigmented polymer systems, textile applications, plasticization, organosols and plastisols, polyesters, epoxies and phenolics as related to the basic polymer properties. Reinforcement of polymer systems and the properties to be obtained.
(Offered yearly, 2nd semester)

11.711 Biochemistry Prep. One year of physical chemistry
and one year of organic chemistry
Consideration of protein chemistry including structure, acid-base equilibria, protein interactions, and proteins as enzymes. Equilibria and free energy of biochemical systems. Enzyme kinetics.
(Offered 1965-66, 1st semester)

11.712 Biochemistry Prep. One year of physical chemistry
and one year of organic chemistry
Biological oxidation-reduction reactions. Metabolism of carbohydrates,
fats, proteins, amino acids, nucleic acids, porphyrins, and steroids.
Photosynthesis. (Offered 1965-66, 2nd semester)

11.713 Biochemistry Prep. One year of physical chemistry
and one year of organic chemistry
Consideration of body fluids, permeability: chemistry of respiration,
hemoglobin, electrolytes, water, and acid-base balance. The biochemistry
of endocrine glands. Discussion of the chemistry of nutrition.
(Offered 1964-65, 1st semester)

English

Admission

To be enrolled for graduate work in English, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least fifteen semester hours of English.

THE MASTER'S DEGREE

Program

In addition to the language requirement, thirty semester hour credits of academic work are required. This may be fulfilled by taking ten courses each with three semester hour credits or by taking eight courses and a thesis for six semester hour credits. Permission to write a thesis must be approved by the chairman of the department.

With the approval of the faculty advisor, a maximum of six semester hours of the thirty semester hours of credit required for the degree may be elected from graduate courses in other departments. With the approval of the faculty advisor, a maximum of eight semester hours of the thirty semester hours of credit required for the degree may be elected from advanced undergraduate courses.

Language Requirement

In accordance with the general Graduate Division regulations, proficiency must be demonstrated in a foreign language, to be specified by the department.

DESCRIPTION OF COURSES

All courses carry three semester hour credits unless specified otherwise.

30.100   Topics in the Study of English

A seminar designed to acquaint the student with the techniques and background of English studies.   (Offered 1965-66, 1st semester)

30.101   The English Novel

Background and sources of the first English novels, followed by a study of types and techniques which developed during the latter half of the eighteenth century; detailed consideration of major representative novelists from Richardson to the early Victorians.

(Offered yearly, 1st semester)

30.102 The English Novel

A survey of the nineteenth century novel in England as a reflection and interpretation of the life of the times; detailed study of the Bronte sisters, Dickens, Collins, Thackeray, Eliot, Trollope, Meredith, and Hardy; consideration of other writers as representative of types, trends, and techniques in the Victorian novel.   (Offered yearly, 2nd semester)

30.103 Poe, Hawthorne, Melville

Critical study of the works of Poe, Hawthorne, and Melville, employing the aesthetic rather than the historical approach.

(Offered 1964-65, 1st semester)

30.105 Realism in the American Novel, 1870-1917

The course will be based upon the close reading and discussion of selected works by Twain, Howells, James, and Dreiser. It will consider critical theory as well as the practice of realism in the period.

(Offered 1965-66, 2nd semester)

30.106 Cooper, Emerson, Thoreau, and Whitman

American Romanticism as it is represented in the work of four major authors. The course will be based upon the close reading of selected texts.   (Offered 1964-65, 2nd semester)

30.107 The Augustan Age

Major works of Dryden, Swift, and Pope will be studied, with close reading of selected texts and general reading of others for background.

(Offered 1965-66, 1st semester)

30.108 Milton

A textual study of Milton's poetry with particular emphasis on Paradise Lost, the minor poems and the prose being treated primarily as contributing to the thorough understanding of the major work.

(Offered 1964-65, 2nd semester)

30.109 Chaucer

The emphasis in this course will be placed on The Canterbury Tales and Troilus. No previous course in Chaucer will be assumed.

(Offered 1965-66, 1st semester)

30.110 Chaucer

A study of works of Chaucer other than the Canterbury Tales with particular attention to Troilus and Criseyde. No previous course in Chaucer is assumed.   (Offered 1965-66, 2nd semester)

30.111 Spenser

Critical study of The Faerie Queene, with discussion of the minor poems as an aid in understanding the major work.

(Offered 1964-65, 1st semester)

30.112   Dickens
Reading and study in depth of five novels representative of the author's artistic and intellectual development from 1846 to 1866 with emphasis upon changes in and refinement of theme, philosophy, and so forth. Attention will be paid also to (1) interrelationship of life and works, (2) importance as social historian-critic, (3) history of Dickens criticism. Collateral reading and written reports as assigned by the instructor.
(Offered 1964-65, 1st semester)

30.115   Major Modern Poets
Readings, in some depth, of poets chosen from the following: Hardy, Yeats, Robinson, Stevens, Frost, Eliot, Pound, Lawrence, the "Fugitives," Crane, Moore, Williams, Cummings, Auden, Thomas.
(Offered yearly, 1st semester)

30.116   Literary Composition: The Writing of Fiction
Practice in the writing of fiction, including some longer forms. Discussion and criticism of student work and selected texts.
(Offered 1965-66, 1st semester)

30.117   Literary Composition: The Writing of Poetry
Practice in various forms and strategies of verse, and some specific assignments in different modes. Discussion and criticism of student work and selected texts.   (Offered 1965-66, 2nd semester)

30.118   Shakespearean Comedy
The comic themes of Shakespeare as found in representative comedies.
(Offered 1964-65, 1st semester)

30.119   Shakespearean Tragedy
The tragic themes of Shakespeare as found in representative tragedies.
(Offered 1964-65, 2nd semester)

30.121   Principles of Literary Criticism
An examination of the basic principles of literary criticism as they appear in the work of major critics of classical antiquity and of English literature from the Renaissance to 1900. The lectures stress Plato, Aristotle, Longinus, Sidney, Dryden, Johnson, Coleridge, Hazlitt, and Arnold. Assigned papers require practical application of the principles of criticism.   (Offered 1964-65, 1st semester)

30.122   Modern Literary Criticism
An investigation of the critical principles that underlie modern English and American literature, as embodied in representative works (novels, drama, poetry) and in theory.   (Offered yearly, 2nd semester)

30.125 Classical Backgrounds

A study of Greek and Roman classics in translation, with emphasis on the classical world-view and its relation to English literature.

(Offered 1965-66, 1st semester)

30.126 Anglo-Saxon

The elements of Anglo-Saxon grammar, accompanied by the reading of simple prose selections and of a small portion of Beowulf.

(Offered 1965-66, 2nd semester)

30.129 Historical Linguistics

Indo-European as a concept and as a family; the place of English in Indo-European with particular reference to Latin, Greek, and so forth; etymology, especially as it involves phonology, morphology, and changes in meaning. (Offered 1964-65, 1st semester)

30.132 Descriptive Linguistics

Phonetics, phonemics, and morphemics; an examination of modern approaches to grammar—descriptive, structural, generative.

(Offered 1964-65, 2nd semester)

30.133 Semantics

Variations in meaning and of the consequent problems in evaluation and response. (Adaptable for both introductory and advanced work in the subject.) (Offered 1965-66, 1st semester)

30.134 Wordsworth, Shelley, and Keats

English Romanticism as revealed in the works of three major poets. Discussion and criticism of the development, philosophy, and art of each poet. (Offered 1964-65, 2nd semester)

30.201 Seminar in Comedy

The comic spirit and its manifestations in dramatic literature and performance from Aristophanes to the present. An examination of the theatre's comic forms—farce, comedy, satire, parody.

(Offered 1965-66, 1st semester)

30.202 Seminar in Tragedy

The nature of tragic drama based on the study of plays and theories. An examination of the various ancient and modern attitudes toward the problems of tragedy. (Offered 1965-66, 2nd semester)

30.205 Major World Dramatists

The art and influence of major dramatists on the texture of world drama. An examination of the work of Sophocles, Aristophanes, Marlowe, Jonson, Moliere, Racine, Lope de Vega, Sheridan, Victor Hugo.

(Offered 1964-65, 1st semester)

30.206   Major Modern Dramatists
The art and influence of major modern dramatists on the modern drama.
An examination of the works of Ibsen, Strindberg, Chekhov, Pirandello,
Shaw, O'Casey, O'Neill, Lorca, Brecht, the Dramatists of the Absurd.
(Offered 1964-65, 2nd semester)

30.300   Assigned Reading in English   Prep. Consent of
                                                departmental chairman
Assigned reading under supervision of a faculty member. Credit: One
semester hour.

History

Admission

To be enrolled for graduate work in history, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least fifteen semester hours of history.

THE MASTER'S DEGREE

Program

In addition to the language requirement, thirty semester hour credits of academic work are required. This may be fulfilled by taking ten courses each with three semester hour credits or by taking eight courses and a thesis for six semester hour credits. Permission to write a thesis must be approved by the chairman of the department.

The course work must include historiography and two courses specifically labeled seminar. Historiography must be taken before starting thesis work if this option is elected. The distribution of courses must be such that no more than 18 semester hours of credit is taken from courses in Group I or Group II.

GROUP I

23.100	Historiography
23.105	Intellectual History of Europe, 1600-1800
23.106	Intellectual History of Europe, 1800-1960
23.107	British History Since 1815
23.108	Seminar in English Labor History
23.112	Modern French History, 1870-1960
23.115	Social and Economic History of Europe, 1600-1815
23.117	Modern German History, 1870-1960
23.122	Seminar in Russian History
23.133	Renaissance and Reformation
23.134	Diplomatic History of Europe Since 1815

GROUP II

23.110	American Social History to 1820
23.111	American Social History since 1820
23.125	Seminar in Recent American History
23.126	The United States and Latin America
23.128	Topics in American Economic History
23.129	The English Colonies in America, 1689-1763
23.130	Seminar in the American Revolution and Constitution, 1763-1789
23.131	American Intellectual History since 1750
23.132	Seminar in American Intellectual History
23.135	American Historians
23.136	Seminar in American Urban History

With the approval of the faculty advisor, a maximum of six semester hours of the thirty semester hours of credit required for the degree may be elected from graduate courses in other departments. With the approval of the faculty advisor, a maximum of eight semester hours of the thirty semester hours of credit required for the degree may be elected from advanced undergraduate courses.

Comprehensive Examination

This examination will be held in accordance with the general Graduate Division regulations.

Language Requirement

In accordance with the general Graduate Division regulations, proficiency must be demonstrated in a foreign language, to be specified by the department.

DESCRIPTION OF COURSES

All courses carry three semester hour credits unless otherwise specified.

23.100   Historiography
The development of historical writing from ancient times to the present. Representative historians are studied, and their styles, philosophies, methods of research, and accuracy in reporting are analyzed. The writing of history from source materials is practiced, and frequent reports analyzing historical problems are required.

(Offered yearly, 1st semester)

23.105   Intellectual History of Europe, 1600-1800
The intellectual development of seventeenth and eighteenth century Europe as a background to more recent thought is the subject matter of this course. Political, scientific, and philosophic thought will be emphasized, though other aspects will be considered also. Theories of absolutism and popular sovereignty, Newtonian science, and the Age of Enlightenment will be developed in full.

(Offered 1965-66, 1st semester)

23.106   Intellectual History of Europe, 1800-1960
This course is a continuation of 23.105 and as such will receive basically the same emphasis. It will treat extensively the various socialist movements and their conservative counterparts; nonsocialist radical thought such as anarchism and nihilism; the growth of evolutionary theory; and the twentieth century phenomenon of totalitarianism.

(Offered 1965-66, 2nd semester)

23.107   British History since 1815
Consideration will be given to political history and to social and economic

changes. Among topics to be considered are industrialization, the growth of democracy and the rise of socialism.

(Offered 1965-66, 2nd semester)

23.108   Seminar in English Labor History
This seminar will evaluate liberalism and conservatism in terms of the historical progress of the English working classes. There will be special attention to research and writing.   (Offered 1965-66, 1st semester)

23.110   American Social History to 1820
The ethnological foundation of American civilization, the ways Americans made their livings, the ways in which they lived, their religion, education, arts and amusements, are the main subjects of this course.

(Offered 1965-66, 1st semester)

23.111   American Social History since 1820
The central theme in this course is the effect on American life of the great growth of industry, the unprecedented rise of science and invention, and the rapid increase of population in the nineteenth and twentieth centuries.   (Offered 1965-66, 2nd semester)

23.112   Modern French History, 1870-1960
The development of the French nation from the Third Republic to the Fifth Republic. The problems growing out of the Franco-Prussian War; the causes and the results of World War I; the search for stability and justice in a period of social, political, and economic tension; the collapse of France in World War II; and the rise of a new France are all studied.

(Offered 1965-66, 2nd semester)

23.115   Social and Economic History of Europe, 1600-1815
This course deals with the development of the social and economic institutions of modern Europe. Beginning with the rise of capitalism and the age of exploration, it traces the expansion of colonialism and mercantilism, and their effect upon the growth of nationalism. The social and economic institutions of the great empires of Spain, France, and England, as well as the effects of the French Revolution, receive emphasis.   (Offered 1965-66, 1st semester)

23.117   Modern German History, 1870-1960
The importance of Germany in the late nineteenth and twentieth centuries will be explored in all its facets. While the emphasis will be on internal development, Germany's relations with her neighbors and her aspirations for empire will, of necessity, receive adequate treatment.

(Offered 1964-65, 1st semester)

23.122   Seminar in Russian History
This seminar will deal with a fairly narrow span or topic in Russian history. It will presuppose a basic knowledge of Russian history and will require extensive work on a term paper as well as assigned readings.

(Offered 1964-65, 2nd semester)

23.125   Seminar in Recent American History
Special topics from the period 1896-1960. Students will read and write around such topics as Theodore Roosevelt and foreign affairs, the home front in World War I, the First New Deal, Truman and the Soviet Union, and others.   (Offered 1964-65, 1st semester)

23.126   The United States and Latin America
Relations between the United States and the Caribbean nations from 1823 to the present. Included will be Mexico, Central America, the Island Republics, and Venezuela and Colombia.
(Offered 1964-65, 2nd semester)

23.128   Topics in American Economic History
This course will treat the history of American transportation and land use. Transportation topics include the development of highways, canals, railroads, and airlines with attention to the roles of private enterprise and government and to competition among the various modes; land use topics will be taken from the twentieth century and will include agriculture, conservation, and mining with attention to government policy in these areas.   (Offered 1964-65, 2nd semester)

23.129   The English Colonies in America, to 1763
The exploration and settlement of the new world, the development of political and social institutions in the British mainland colonies, and relations between the colonies and the mother country.
(Offered 1965-66, 1st semester)

23.130   Seminar in the American Revolution and Constitution, 1763-1789
The revolutionary movement and its impact upon the political, economic, cultural, and intellectual life of Americans.
(Offered 1965-66, 2nd semester)

23.131   American Intellectual History since 1750
The ideas of an agricultural society and of an industrial society and the context in which the ideas have developed and spread.
(Offered 1964-65, 1st semester)

23.132   Seminar in American Intellectual History
The seminar will focus on Thomas Jefferson as the leading exponent of the Enlightenment in America.   (Offered 1964-65, 2nd semester)

23.133   Renaissance and Reformation
A study of European society during its cultural and intellectual reawakening and a description of the religious changes that occurred on the eve of modern times.   (Offered 1964-65, 1st semester)

23.134   Diplomatic History of Europe since 1815-1914

The formation and execution of the foreign policies of the chief European powers with emphasis on changing alliances and alignments, imperialistic rivalries, and efforts at international organization.

(Offered 1964-65, 2nd semester)

23.135   American Historians

The writing of American history by Americans from colonial times to the present with emphasis on changes in both form and substance.

(Offered 1965-66, 2nd semester)

23.136   Seminar in American Urban History

The political, economic, and social life of America's major cities with special emphasis on Boston's last century.

(Offered 1964-65, 1st semester)

23.300   Assigned Reading in History

Prep. Consent of departmental chairman

Assigned reading under supervision of a faculty member.

Credit: one semester hour.

23.501-23.504   Thesis—Seminar

Thesis supervision by members of the department.   (Offered yearly)

Mathematics

Admission

To be enrolled for graduate work in mathematics, applicants must have obtained a bachelor's degree from a recognized institution with an under-graduate program which included nine semester hours of mathematics beyond integral calculus. If the mathematics which the student took did not include two semesters of advanced calculus, his registration must be in 14.107 Advanced Calculus followed by 14.108 Advanced Calculus. These courses will count as graduate credits.

Full-Time Program on Co-operative Plan

The full-time program in mathematics operates on the Co-operative Plan as described on the page preceding the academic calenders. The thirty semester hours of work required for the degree will normally be distributed over four terms according to the following pattern.

FIRST YEAR

First Terms		Second Terms	
Required Courses	6	Required Courses	6
Elective Courses	2	Elective Courses	2

SECOND YEAR

Required Courses	4	Required Courses	4
Elective Courses	4	Elective Courses	2

The program for each student will be made up from the required and elective courses available in each term and approved by the chairman of the department.

Required Courses

14.241	Modern Algebra	14.324	Theory of Functions of a Real Variable
14.242	Modern Algebra		
14.320	Theory of Functions of a Complex Variable	14.330	Functional Analysis I
		14.331	Functional Analysis II
14.321	Theory of Functions of a Complex Variable	14.900	Seminar
		14.901	Seminar
14.323	Theory of Functions of a Real Variable		

Electives

The electives must be taken from other graduate courses or from appropriate advanced undergraduate courses approved by the faculty advisor. To obtain graduate credit for advanced undergraduate courses a student must have a grade of A or B.

Comprehensive Examination

This examination will be held in accordance with the general Graduate Division regulations.

Evening Part-Time Program

The admission requirements for this program are the same as for the full-time program, but students may progress according to their abilities and the time available.

Required Courses

14.241	Modern Algebra	2
14.242	Modern Algebra	2
14.320	Theory of Functions of a Complex Variable	2
14.321	Theory of Functions of a Complex Variable	2
14.323	Theory of Functions of a Real Variable	2
14.324	Theory of Functions of a Real Variable	2
		12

Electives

Eight semester hours must be elected from mathematics courses. Ten semester hours may be elected from any courses in engineering, mathematics, or physics for which the student has the necessary preparation.

DESCRIPTION OF COURSES

The following noncredit course is offered for those students whose undergraduate mathematical preparation is weak because they have not had differential equations or because they have been away from formal mathematical work for some time.

14.07   Differential Equations   Prep. Differential and integral calculus
Standard methods of solving ordinary differential equations; equations of first order and first degree; linear equations of higher order with constant co-efficients, methods of undetermined co-efficients, variation of parameters; first-order equations of higher degree; special second-order equations with variable co-efficients.

(Offered yearly, 1st and 2nd semesters)

GRADUATE COURSES

All courses carry two semester hour credits unless otherwise specified.

14.101   Advanced Mathematics   Prep. Differential equations
Series solution of differential equations, Legendre and Bessel functions, Fourier series, orthogonal functions, Scalar and vector fields, gradient, divergence, and curl. Boundary value problems involving partial differential equations: wave equation, heat flow, Laplace equation.

(Offered yearly, 1st and 2nd semesters; also 1st term)

14.102   Advanced Mathematics   Prep. 14.101 Advanced Mathematics
or equivalent
Matrix algebra, linear vector spaces, characteristic-value problems. Quadratic forms, transformations, discriminants and invariants, diagonalization of symmetric matrices. Characteristic numbers of nonsymmetric matrices, function space Sturm-Liouville problems. Application of the above methods of analysis to selected topics in calculus of variations, difference equations, and/or integral equations.

(Offered yearly, 1st and 2nd semesters; also 1st and 2nd terms)

14.107   Advanced Calculus   Prep. Differential equations
(Open only to mathematics majors)
Functions of one real variable: limits, continuity, differentiability, the Riemann integral, mean-value theorems of both differential and integral calculus. Sequences, their limits and bounds. Functions of several variables; partial differentiation, especially for implicit and composite functions.   (Offered yearly, 1st and 2nd semesters)

14.108   Advanced Calculus   Prep. 14.107 Advanced Calculus
Continued study of the calculus of functions of several variables. Extremal problems, transformations and mappings of coordinates, vector field theory, line and surface integrals. Improper integrals: gamma function, Laplace transform.   (Offered yearly, 2nd semester)

14.200   Numerical Analysis   Prep. 14.201 Principles of Automatic
Computation or knowledge of programming
Numerical solution of linear and nonlinear systems of equations with aid of determinants, matrices. Newton's method, method of steepest descent, direct and inverse interpolation. Lagrange interpolation formula, Aitken's method, numerical differentiation and integration. Curve fitting by least squares with the use of orthogonal polynomials. Harmonic analysis. Each student will be expected to completely analyze, program, and run at least one major problem on the University IBM 1620 Computer.

(Offered yearly, 2nd semester)

14.201   Principles of Automatic Computation

Prep. Differential equations
Description of computing processes and programming of digital computers. Basic concepts of computation on a stored program computer

as well as a detailed study of the preparation of specific programs in machine language and problem oriented languages for the IBM 1620 Computer. Introduction to automatic programming including interpretation and compilation. Binary, octal, and decimal number systems. Application of general purpose digital computers to numerical problems in mathematics and physics. (Offered yearly, 1st semester)

14.205 Difference Equations Prep. 14.108 Advanced Calculus or its equivalent or 14.102 Advanced Mathematics
Formulation and solution of difference equations; approximate solution of engineering problems by finite-difference methods; relaxation techniques; stability and convergence of approximate methods. Applications to elastic systems, electrical networks, filters, potential theory, wave propagation, heat flow, etc. (Offered yearly, 2nd semester)

14.220 Statistics Prep. 14.230 Probability
Fundamental statistical methods. Tests of significance and estimation based on large or small samples; simple correlation and linear regression; introduction to analysis of variance and sequential analysis. Application to quality control and other engineering problems.
(Offered yearly, 2nd semester; also 2nd term)

14.230 Probability Prep. Differential and integral calculus
Fundamentals of probability theory; sample spaces, axioms, algebraic relations. Independent and dependent trials, Markov chains. Discrete probability laws including binominal and Poisson; continuous distributions including uniform and normal. Mean and variance, moments, moment-generating functions, the law of large numbers, the central limit theorem. (Offered yearly, 1st semester; also first term)

14.235 Stochastic Processes Prep. 14.230 Probability
Denumerable state models: Markov chains. Continuous probability spaces. Conditional probabilities. Stationary processes. Markov processes: jump processes with continuous time, diffusions. Random harmonic analysis. (Offered yearly, 2nd semester)

14.241 Modern Algebra Prep. 14.108 Advanced Calculus or its equivalent or 14.102 Advanced Mathematics
Introduction to the general algebraic properties of groups, rings, ideals, fields, and algebras. (Offered yearly, 1st semester)

14.242 Modern Algebra Prep. 14.241 Modern Algebra
Properties of general fields; Galois fields, abstract vector spaces. General linear transformations; matrices and their properties; diagonalization and inversion of matrices. Application to solution of algebraic equations, ordinary differential equations, boundary value problems, and integral equations. (Offered yearly, 2nd semester)

14.310   Vector Analysis   Prep. 14.108 Advanced Calculus or its
equivalent or 14.102 Advanced Mathematics
The theory and method of vector analysis as applied in physics and applied mathematics.   (Offered 1965-66, 2nd semester)

14.313   Tensor Analysis I   Prep. 14.310 Vector Analysis or equivalent,
and 14.102 Advanced Mathematics or
14.108 Advanced Calculus or equivalent
Tensor algebra: Review of three-dimensional point and vector spaces in the setting of tensor analysis. Linear algebra and n-dimensional affine space. The coordinate tensor, tensor products, invariants, physical components. Symmetric and alternating tensors, rank and support, duality. The metric tensor.   (Offered 1965-66, 1st semester)

14.314   Tensor Analysis II   Prep. 14.313 Tensor Analysis I
or equivalent
Tensor Calculus: Curvilinear coordinates, tangent spaces. Tensor fields, convariant derivative. Riemannian geometry, geodesics, curvature tensor. Parallel displacement, linear connections. Exterior forms.
(Offered 1965-66, 2nd semester)

14.320   Theory of Functions of a Complex Variable   Prep. 14.108
Advanced Calculus or its equivalent or
14.102 Advanced Mathematics
The general theory of functions of a complex variable. Cauchy's theorem. Taylor's and Laurent's series, the theory of residues, conformal mapping, the Schwartz-Christoffel transformation.
(Offered yearly, 1st semester; also 1st term)

14.321   Theory of Functions of a Complex Variable   Prep. 14.320
Theory of Functions of a Complex Variable
This course continues 14.320 and extends the development of the general theory of functions of a complex variable to more advanced topics. Application of the theory to physical and engineering problems.
(Offered yearly, 2nd semester; also 2nd term)

14.323   Theory of Functions of a Real Variable   Prep. 14.242
Modern Algebra or 14.108 Advanced Calculus
Theory of sets, metric spaces and applications to the topology of the real line and Euclidean N-space, closed and open sets, continuous and uniformly continuous functions. Connected, totally bounded, and compact sets. Heine-Borel theorem, extension theorems for continuous functions and applications to integration theory.
(Offered yearly, 1st semester; also 1st term)

14.324　Theory of Functions of a Real Variable　　Prep. 14.323 Theory of
Functions of a Real Variable

Integration theory on abstract measure spaces and its specialization to
Lebesgue theory on the real line Outer measure, signed measure, measurable functions. Lebesgue convergence theorem, Radon-Nikodym theorem, product measures, and Fubini's theorem. Vitali coverages, Lebesgue
Stieltjes integral, and applications to probability theory.

(Offered yearly, 2nd semester; also 2nd term)

14.330　Functional Analysis I　　Prep. 14.324 Theory of Functions
of a Real Variable

Metric spaces, principle of contraction mappings, compact sets, normed
vector spaces, Hahn-Banach theorem, linear operators, applications.

(Offered yearly, 1st term)

14.331　Functional Analysis II　　Prep. 14.330 Functional Analysis I

Linear operators (continuation), principle of uniform boundedness, interior mappings principle, compact transformations, applications.

(Offered yearly, 2nd term)

14.340　Calculus of Variations　　Prep. 14.108 Advanced Calculus or its
equivalent or 14.102 Advanced Mathematics

The minima of simple integrals in nonparametric form in three-space.
Necessary and sufficient conditions for a minimum, fields, the Hamilton-Jacobi theory.　　(Offered 1965-66, 2nd semester)

14.351　Special Topics in Mathematics　　Prep. 14.102 Advanced
Mathematics or 14.108 Advanced Calculus

Selected topics in advanced mathematics.

14.352　Special Topics in Mathematics　　Prep. 14.102 Advanced
Mathematics or 14.108 Advanced Calculus

Selected topics in advanced mathematics.

14.530　Partial Differential Equations　　Prep. 14.108 Advanced Calculus
or its equivalent or 14.102 Advanced Mathematics

Formulation of boundary value problems and methods of solution of
elliptic equations. Separation of variables: Laplace and Poisson equations, Sturm-Liouville theory including eigenfunction expansions and
transform methods, Green's functions, Schmidt-Hilbert method.

(Offered 1964-65, 1st term)

14.531　Partial Differential Equations　　Prep. 14.530 Partial
Differential Equations

Solution of hyperbolic equations; steady wave equations, Helmholtz
equations, plane, cylindrical, and spherical wave expansions, scalar wave
equations; solution of parabolic equations, diffusion equations.

(Offered 1964-65, 2nd term)

14.540   Nonlinear Differential Equations   Prep. 14.108 Advanced
Calculus or its equivalent or 14.102 Advanced Mathematics
The topological methods of Poincare, the work of van der Pol. Oscillations, nonlinear resonance, and other applications.

(Offered 1964-65, 1st semester)

14.550   Integral Equations   Prep. 14.108 Advanced Calculus or its
equivalent or 14.102 Advanced Mathematics
Linear integral equations, eigen-value theory, relation to infinite systems
and differential equations, applications in mechanics and physics.

(Offered 1964-65, 1st semester)

14.600   Differential Geometry   14.108 Advanced Calculus or its
equivalent or 14.102 Advanced Mathematics
Differential properties of space curves, developable surfaces, curved
surfaces, and systems of curves on surfaces.

(Offered 1965-66, 1st semester)

14.700   Topology   Prep. 14.324 Theory of Functions of a Real Variable
A survey of the fundamental problems of topology, that branch of geometry which studies those properties of geometric figures which remain
invariant under bicontinuous transformations, and a discussion of its
significance to most fields of modern mathematics. Detailed study of
metric and general topological spaces with application to real variables,
differential equations; fundamental theorem of algebra.

(Offered 1964-65, 2nd semester)

14.900-14.901   Seminar
Discussion of selected topics in advanced mathematics.

(Offered yearly)

Physics

Admission

To be enrolled for graduate work in physics, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included twelve semester hours of physics, including modern physics, and mathematics through differential equations.

THE MASTER'S DEGREE

Program

Each student will have a faculty advisor who will approve his program of study. Certain senior undergraduate courses may be required if the student's background requires such work.

A thesis option for which credits will be arranged is available for students pursuing the program on a full-time basis.

The program may be completed on an evening part-time basis, and the students may progress according to their ability and time available.

Required Courses

15.101	Classical Mechanics I	2
15.102	Electromagnetic Theory I	2
15.103	Classical Mechanics II	2
15.104	Electromagnetic Theory II	2
15.111, 15.112	Mathematical Physics I and II	4
or		
14.101, 14.102	Advanced Mathematics	4
15.305	Quantum Theory I and II	4
		16

Electives

Four semester hours must be elected from physics courses. Ten semester hours may be elected from any courses in physics, engineering, or mathematics for which the student has the necessary preparation.

THE DOCTOR'S DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Physics.

Admission

Students admitted to full-time study in physics are eligible to take the qualifying examination in accordance with the informaton given under the heading of Qualifying Examination.

Students enrolled in the evening part-time master's degree program, who wish to qualify for Ph.D. candidacy, may so indicate by petition to the Graduate Study Committee of the Physics Department. The petition should be a letter containing a timetable for the taking of qualifying examinations and a course plan for completing thirty semester hours of graduate study.

Qualifying Examination

The qualifying examination consists of a written and an oral part; the written part covers the fields of mechanics, electricity and magnetism, modern physics, optics, and thermodynamics. These examinations are given twice a year, once in October and once in February. All full-time students must take these examinations by the third semester of their registration for graduate work. If the examination is failed, the student is allowed to repeat the examination by the end of the fourth semester of registration for graduate work. The departmental graduate committee may set other completion dates for students who have taken graduate work in some other institution or are not currently enrolled in the full-time program. All students intending to take the qualifying examination should notify the department by the middle of September or the first of February.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

Residence Requirements

After degree candidacy has been established, the residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the student's advisor in order to give evidence that at least half of the time is being devoted to the requirements of the Graduate Division program.

Comprehensive Examination

The comprehensive examination consists of a written and an oral part. The written part is made up of two three-hour examinations. One of these examinations covers the fields of classical mechanics, quantum mechanics, and electromagnetic theory. The other examination covers material from the fields of thermodynamics, statistical mechanics, plasma physics, nuclear physics, elementary particles, solid state, and special relativity. Within two weeks after the written comprehensive examination is taken, the thesis advisor will choose two other members of an oral examination committee and notify the student of an area to be covered in the examination and the time at which it is to be given. The oral examination will normally be taken within one month of the time at which the written examination was taken.

The student is expected to take these examinations by the end of the fourth semester of graduate work, but in any case, they must be passed no later than two years after degree candidacy has been established. An examination in one foreign language must be passed before the comprehensive examination is taken.

Course Requirements

The course requirements, in addition to the minimum requirement of thirty semester hours credit, are established by the departmental graduate committee for each candidate.

Thesis

In some cases, arrangements for a thesis advisor may have been established before the completion of the qualifying examinations. If not, such arrangements must be made as soon as possible after degree candidacy has been established. Depending upon the nature of a project, a thesis committee may be appointed by the chairman of the department. This committee will be kept informed of the progress of the thesis and will approve the thesis in its final form.

Language Requirement

Proficiency must be demonstrated in two foreign languages as specified by the Departmental Graduate Committee in accordance with the general Graduate Division regulations. This proficiency is demonstrated by taking an examination administered by the Physics Department. An examination in one language must be passed before the comprehensive examination is taken.

Final Oral Examination

This examination will be held in accordance with the Graduate Division regulations.

DESCRIPTION OF COURSES

All courses carry two semester hour credits unless otherwise specified.

15.101 Classical Mechanics I (Theoretical Mechanics)   Prep. Admission to science or engineering graduate program
Newton's laws of motion. D'Alambert principle. Lagrange's equations. Hamilton's principle. Central forces. Motion of rigid bodies.
(Offered yearly, 1st and 2nd semesters)

15.102 Electromagnetic Theory I   Prep. Admission to science or engineering graduate program
Electrostatic field and potentials. Multipole expansions. The static mag-

netic field. Stationary current problems. Fields in material media. Two and three dimensional boundary value problems. Maxwell equations.
(Offered yearly, 1st and 2nd semesters)

15.103   Classical Mechanics II   Prep. 15.101 Classical Mechanics I
Hamilton's equations; principle of least action. Canonical transformations. Hamilton-Jacobi theory. Classical perturbation theory.
(Offered yearly, 2nd semester)

15.104   Electromagnetic Theory II   Prep. 15.102
Electromagnetic Theory I
Maxwell equations. Scalar and vector potentials. Energy and momentum of the electromagnetic field. Boundary conditions, plane waves and spherical waves. Scattering and radiation of electromagnetic waves. Fourier analysis.   (Offered yearly, 2nd semester)

15.111   Mathematical Physics I   Prep. 15.101 Classical Mechanics I
(may be taken concurrently)
An introduction to the mathematical methods of theoretical physics. Complex variables. Calculus of residues. Conformal mapping series and integral transform solutions of ordinary differential equations.
(Offered yearly, 1st semester)

15.112   Mathematical Physics II   Prep. 15.111 Mathematical Physics I
Boundary value problems. Eigen-functions and their uses. Green's functions. Partial differential equations of physics.
(Offered yearly, 2nd semester)

15.201   Introductory Modern Physics   Prep. Admission to science or
engineering graduate program
(May not be used for credit toward the degree requirements of
the program in physics)
A study of the physical discoveries made since 1900. Introduction to special relativity. The discovery of the electron; its emission from matter. The origins of quantum theory. The nuclear atom and the Bohr theory of hydrogen and its spectrum. Atomic structure and optical spectra. Schrodinger's wave mechanics.   (Offered yearly, 1st semester)

15.202   Introductory Modern Physics   Prep. 15.201 Introductory
Modern Physics
(May not be used for credit toward the degree requirements of
the program in physics)
A continuation of the first semester. X-rays. The atomic nucleus. Natural radioactivity. Isotopes. Artificial radioactivity: The neutron, the protron, the positron. Particle accelerators, nuclear reactions, nuclear forces, fission and fusion. Cosmic rays and fundamental particles.
(Offered yearly, 2nd semester)

15.203 Introductory Nuclear Physics   Prep. A one-year course in modern or atomic and nuclear physics
Basic description of nuclei; radioactivity. The detection of nuclear radiation. Particle accelerators. Nuclear masses and other properties of nuclei.   (Offered yearly, 1st semester)

15.204 Introductory Nuclear Physics   Prep. 15.203 Nuclear Physics
Nuclear models. Magnetic and electric moments of nuclei. Nuclear transitions. Nuclear reactions. Fission. High energy physics.
     (Offered yearly, 2nd semester)

15.205 Introductory Solid State Physics   Prep. A one-year course in modern or atomic and nuclear physics
An introduction to the electrical and magnetic properties of solids.
     (Offered yearly, 1st semester)

15.206 Introductory Solid State Physics   Prep. 15.205 Introductory Solid State Physics
Optical and thermal properties of solids.   (Offered yearly, 2nd semester)

15.207 Electromagnetic Theory III   Prep. 15.104 Electromagnetic Theory II
Classical relativistic electrodynamics and classical field theory.
     (Offered yearly, 1st semester)

15.208 Electromagnetic Theory IV   Prep. 15.207 Electromagnetic Theory III
A continuation of 15.207.   (Offered yearly, 2nd semester)

15.209 Statistical Mechanics   Prep. 15.101 Classical Mechanics I
A review of thermodynamics. Partition function and density matrix for the canonical and grand canonical ensemble and their connection with thermodynamic functions. Application to specific examples. Techniques of the many body problem with applications.
     (Offered 1965-66, 1st semester)

15.210 Statistical Mechanics   Prep. 15.209 Statistical Mechanics
A continuation of 15.209.   (Offered 1965-66, 2nd semester)

15.305 Quantum Theory I and II   Prep. 15.101 Classical Mechanics I
Experimental basis, Schrodinger equation and probability interpretation, uncertainty principle, one dimensional problems, operator and non-operator methods in harmonic oscillator, orbital angular momenta, entral force problems, scattering theory. Credit: 4 semester hours.
     (Offered yearly, 1st semester)

15.306 Quantum Theory III and IV   Prep. 15.305 Quantum Theory
I and II

General formulation of quantum mechanics; time independent perturbation theory (non-degenerate and degenerate), time dependent perturbation theory, Pauli wave equation. Credit: 4 semester hours.

(Offered yearly, 2nd semester)

15.307 Quantum Theory of Fields I   Prep. 15.306 Quantum Theory
III and IV

Dirac electron theory. The radiation field. Second quantization. Positron theory. Credit: 3 semester hours.   (Offered 1965-66, 1st semester)

15.308 Quantum Theory of Fields II   Prep. 15.307 Quantum Theory
of Fields I

Coupled fields. Relativistic scattering theory. Radiative correction to hyperfine structure. Lamb shift. Credits: 3 semester hours.

(Offered 1965-66, 2nd semester)

15.309 Theoretical Nuclear Physics I   Prep. 15.306 Quantum Theory
III and IV or the equivalent (may be taken concurrently)

Experimental background. Two body problems. Light nuclei; heavy nuclei.
Credits: 3 semester hours.   (Offered 1964-65, 1st semester)

15.310 Theoretical Nuclear Physics II   Prep.15.309 Theoretical
Nuclear Physics I

Interaction with the electromagnetic field. Nuclear reactions. Elementary particles. Credits: 3 semester hours.   (Offered 1964-65, 2nd semester)

15.311 Solid State Physics I   Prep. 15.302 Quantum Theory II
Selected topics in the quantum theory of solids. The band theory of
metals.   (Offered 1964-65, 1st semester)

15.312 Solid State Physics II   Prep. 15.311 Advanced
Solid State Physics I

Semiconduction and ionic crystals. The electric, magnetic, and thermal properties of matter.   (Offered 1964-65, 2nd semester)

15.313 Advanced Laboratory   Prep. 15.204 Nuclear Physics
and 15.206 Introductory Solid State Physics
Experiments in Modern Physics.   (Offered 1965-66, 1st semester)

15.314 Advanced Laboratory   Prep. 15.313 Advanced Laboratory
Experiments in Modern Physics.   (Offered 1965-66, 2nd semester)

15.315 Quantum Theory V   Prep. 15.306 Quantum Theory III and IV
Special topics in non-relativistic and relativistic quantum mechanics (e.g., Dirac equation, addition of angular momentum problems, non-relativistic field theory). Credit: 3 semester hours.

(Offered yearly, 1st semester)

15.321   Elementary Particle Physics I   Prep. 15.306
Quantum Theory III and IV

The purpose of this course is to acquaint students with current ideas in elementary particle physics. Material will be selected from such areas as meson interactions and resonances, baryon interactions and resonances, electromagnetic properties of strongly interacting particles, and weak interactions of elementary particles.

(Offered 1964-65, 1st semester)

15.322   Elementary Particle Physics II   Prep. 15.407 Elementary
Particle Physics I or consent of instructor

A continuation of 15.407. Selected topics in elementary particle physics will be discussed.   (Offered 1965-66, 2nd semester)

15.403   Plasma Physics I   Prep. 15.102 Electromagnetic Theory I

Motion of charged particles in electromagnetic fields. Boltzmann equation for plasmas. Fundamentals of magneto-hydro-dynamics. Applications to include mirror geometry, high frequency confinement, plasma confinement and heating by means of magnetic fields, motion of plasmas along and across magnetic field lines.   (Offered 1965-66, 1st semester)

15.404   Plasma Physics II   Prep. 15.403 Plasma Physics I

Plasma oscillations; waves in magneto plasmas. Dispersion relations. Fokker-Plank equations for plasmas; plasma conductivity; run-away electrons; relaxation times; radiation phenomena in magneto plasmas; stability theories; relativistic plasmas. (Offered 1965-66, 2nd semester)

15.407   Special Topics in Physics   Prep. Consent of
department chairman

A discussion of special topics in physics.   (Offered yearly, 1st semester)

15.408   Special Topics in Physics   Prep. Consent of
department chairman

A discussion of special topics in physics. (Offered yearly, 2nd semester)

15.501-15.502   Thesis-Seminar

Experimental and theoretical work for master's degree.

(Offered yearly)

15.503-15.504   Seminar   Prep. Admission to the Ph.D. program

Discussion of selected topics in advanced physics.   (Offered yearly)

15.505-15.506   Thesis   Prep. Admission to the Ph.D. program

Experimental and theoretical work for Ph.D. candidates.

(Offered yearly)

15.507-15.508   Special Problems in Physics   Prep. Consent of
department chairman

Theoretical or experimental work under individual faculty supervision.

(Offered yearly)

Political Science

Admission

To be enrolled for graduate work in political science, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least fifteen semester hours of political science or government courses.

THE MASTER'S DEGREE

Program

Thirty semester hour credits of academic work are required. This may be fulfilled by taking ten courses each with three semester hour credits or by taking eight courses and a thesis for six semester hour credits.

Permission to write a thesis must be approved by the chairman of the department.

With the approval of the faculty advisor, a maximum of six semester hours of the thirty semester hours of credit required for the degree may be elected from graduate courses in other departments. With the approval of the faculty advisor, a maximum of eight semester hours of the thirty semester hours of credit required for the degree may be elected from advanced undergraduate courses.

Comprehensive Examination

This examination will be held in accordance with the general Graduate Division regulations.

Language Requirement

In accordance with the general Graduate Division regulations, proficiency must be demonstrated in a foreign language to be specified by the department.

DESCRIPTION OF COURSES

All courses carry three semester hour credits unless otherwise specified.

22.131   Recent Political Theory

An examination of ideas from the time of the French and American revolutions to the present, with special emphasis upon the impact of economic and technical change in the nineteenth and twentieth centuries on the course of Western political thought.

(Offered 1965-66, 1st semester)

22.151   Federal Legislative Process

A study of Congress and the effect on Federal legislation of the activities of the administration and judicial branches with particular stress on Congressional-Presidential relations.   (Offered 1964-65, 1st semester)

22.156   Seminar in American Government

An analysis in depth of selected problems in American Government. Examples of problems are: Federal-State relationships, legislative re-apportionments, and the decline of Congress as a law-making body.

(Offered 1965-66, 2nd semester)

22.160   Federal Administrative Process and Public Policy

An examination of the processes of policy execution in the Federal government with focus on the role of the President.

(Offered 1964-65, 2nd semester)

22.172   United States-Soviet Relations

A study of the relations between the United States and the Soviet Union from 1917 to the present. Such topics as the Soviet political system, the "non-recognition" period, and the origins and nature of the present power conflict are stressed.   (Offered 1965-66, 2nd semester)

22.180   Nationalism

An examination of the evolution and role of nationalism in contemporary international relations. Representative nationalistic movements and theories are covered.   (Offered 1965-66, 1st semester)

22.192   Seminar: The Politics of Revolution and Change

An analysis of the nature of political change with attention to both theory and practice. Such topics as revolution, major trends in contemporary politics, and the relationship between political change and other types of change (for example, technological and scientific) will be considered.

(Offered 1965-66, 2nd semester)

22.196   Totalitarianism

An analysis of totalitarianism and dictatorship including study of historical background, fundamental characteristics, theories of origin, nature, and significance, and evaluation of techniques, ideologies, policies, and instruments of power.   (Offered 1964-65, 2nd semester)

22.200   Seminar in Public Administration

Selected problems in public administration at all levels, with special attention to state and local processes.

(Offered 1965-66, 2nd semester)

22.203   Seminar in Urban Government

A study of the contemporary crisis in urban government stressing the problems of political independence, the rapid growth of suburban and metropolitan areas, and the decline and decay of the core city. Particular emphasis will be given to the Boston metropolitan area.

(Offered 1965-66, 2nd semester)

22.205   Massachusetts State Government

Study of selected problems relating to the structure and functions of the three branches of government, to partisan and non-partisan political organization, and to interest group activity.

(Offered 1964-65, 1st semester)

22.232   Seminar in United States Foreign Policy

An examination of the role of the United States in world politics. Historical background, analysis of problems involved in policy formulation and execution, and specific contemporary issues are covered.

(Offered 1964-65, 2nd semester)

22.300   Assigned Reading in Political Science   Prep. Consent of
                                                             departmental chairman

Assigned reading under supervision of a faculty member. Credit: One semester hour.

22.501-22.504   Thesis—Seminar

Thesis supervision by individual members of the department.

(Offered yearly)

Psychology

Admission

To be enrolled for graduate work in psychology, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least fifteen semester hours of phychology including experimental psychology and statistics. All applicants for assistantships or fellowships must take the Graduate Record Examination. The Miller Analogy Test is desirable, but not required.

THE MASTER'S DEGREE
Full-time Program

Each student will have a faculty advisor who will approve his program of study. A thesis is required for five semester hours credit. Arrangements for the thesis advisor will be made by the chairman of the department.

The thirty semester hours of required work are normally taken in accordance with the following pattern:

FIRST YEAR

First Semester			Second Semester		
25.105	Theories of Learning	2	25.101	Statistics in Psychology	3
25.110	Sensory Processes .	2	25.104	Motivation	2
25.130	The History of Psychology	2	25.111	Experimental Laboratory	2
	Elective	2		Elective	2
		8			9

SECOND YEAR

First Semester			Second Semester		
25.108	Personality Theory .	2	25.106	Cognitive Processes	2
25.112	Perceptural Processes	2	25.154	Thesis	3
25.153	Thesis	2			5
	Elective	2			
		8			

Four semester hours of psychology courses must be elected from:

25.121	Tests and Test Procedures	2
25.138	Physiological Psychology	2
25.141	Current Issues in Psychology	2
25.144	Social Psychology	2

Language Requirement

In accordance with the general Graduate Division regulations, proficiency must be demonstrated in a foreign language, to be specified by the department.

Evening Part-time Program

The admission requirements are the same as for the full-time program but students may progress according to their abilities and time available. The required courses are the same as those for the full-time program. Included in the first three graduate course registrations must be the following courses to be taken in the semesters when they are offered:

25.101   Statistics in Psychology
25.110   Sensory Processes
25.111   Experimental Laboratory

DESCRIPTION OF COURSES

All courses carry two semester hour credits unless otherwise specified.

25.101   Statistics in Psychology. Prep. A basic course in statistics through simple analysis of variance
This course is concerned with some of the more complex quantitative methods available for the analysis of psychological data. Such topics as tests of significance, multiple and partial correlation, complex analysis of variance, covariance, sampling techniques, and nonparametric methods will be considered. Credit: 3 semester hours.

(Offered yearly, 2nd semester)

25.104   Motivation

The nature and determinants of motivation, the instigators of thought and action. Dealing wih both animals and human motives, but centering mainly upon the latter, the course will consider basic theories as well as relevant experimental evidence and methodological problems. Members of the class will participate in the presentation of material.

(Offered 1964-65, 2nd semester)

25.105   Theories of Learning

An analysis of the basic theories and principles of conditioning and learning. Major emphasis will be placed upon relevant experimental findings and research techniques.   (Offered 1964-65, 1st semester)

25.106   Cognitive Processes

A consideration of the higher mental processes, primarily with reference to the human organism. Topics to be surveyed include verbal learning, memory, problem solving, concept attainment, the relation of language

to thought, and the measurement of meaning. Although historical approaches to these topics will be discussed, emphasis will be placed upon contemporary research and theory.   (Offered 1964-65, 2nd semester)

25.108   Personality Theory

A study of the various theories which have contributed to an understanding of the human personality. Emphasis will be placed upon theories which stress the dynamic integration of the personality. Readings from original sources will supplement class work. Members of the class will participate in the presentation of material.

(Offered 1965-66, 1st semester)

25.110   Sensory Processes

Following a review of the physics, psychophysics, and physiology of hearing, vision, and the other senses, various problems such as the effect of duration, area, masking, and adaptation, which are common to all the senses, will be discussed in detail.

(Offered yearly, 1st semester)

25.111   Advanced Experimental Laboratory   Prep. 25.110
Sensory Processes

Two experiments will be assigned to investigate unsolved problems in hearing, vision, and scaling. A third, original, experiment will be carried out in learning, perception, motivation or some area other than hearing and vision. Four hours of laboratory.

(Offered 1964-65, 2nd semester)

25.112   Perceptual Processes

Theoretical approaches to perception will be surveyed in relation to current experimental findings. Specific topics will include perceptual organization, constancy, the perception of depth and color, figural after-effects, and the influence of motivational and attitudinal determinants upon perception.   (Offered yearly, 1st semester)

25.121   Tests and Test Procedures   Prep. Basic course in statistics

Principles of test construction will be considered with emphasis placed on the concepts of validity, reliability, the establishment of norms, and item analysis. A number of widely used tests will be analyzed intensively.

(Offered 1964-65, 1st semester)

25.130   History of Psychology

The evolution of contemporary theoretical concepts and issues from their historical origins in philosophy and the physical, social, and medical sciences will be considered. Major emphasis will be on the emergence of the scientific method in psychology. Members of the class will participate in the presentation of the material.   (Offered 1964-65, 1st semester)

25.138   Physiological Psychology   Prep. 25.111 Advanced
Experimental Laboratory

An introduction to the physiology of the central and peripheral nervous systems and a survey of the physiological factors involved in sensation, perception, motivation, emotion, and learning.

(Offered 1965-66, 2d semester)

25.141   Current Issues in Psychology   Prep. 25.101 Statistics in
Psychology, 25.104 Motivation, 25.105 Theories of Learning
(Either 25.104 or 25.105 may be taken concurrently.)

This course will consider in detail a number of theoretical problems and issues of concern in the current psychological literature. Topics of broad interest from all major areas of psychology will be treated. Members of the class will participate extensively in the presentation and evaluation of the material.   (Offered 1964-65, 2nd semester)

25.144   Social Psychology

Group phenomena and the influence of the group upon the thought and behavior of the individual. Such topics as social interaction, perception, opinions, attitudes, leadership, and social conflict will be considered. Basic theories as well as fundamental experimental evidence will be explored. Members of the class will participate in the presentation of the material.   (Offered 1964-65, 2nd semester)

25.151-25.153   Seminar

Experimental work under the direction of the department. Credit: 2 semester hours each course.   (Offered yearly)

25.153   Thesis

Experimental work for the Master's degree requirement. Credit: 2 semester hours.   (Offered yearly)

25.154   Thesis

Experimental work for the Master's degree requirement. Credit: 3 semester hours.   (Offered yearly)

Sociology-Anthropology

Admission

To be enrolled for graduate work in Sociology-Anthropology, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least fifteen semester hours in sociology and/or anthropology. In addition, applicants should have taken an undergraduate course in statistics. If such a course has not been taken, students must take a basic course in statistics in addition to the regular graduate requirements.

THE MASTER'S DEGREE

Program

Thirty semester hours of academic work are required. Each student will have a faculty advisor who will approve his program of study. A thesis is required for six semester hours of credit. Arrangements for the thesis advisor will be established by the head of the department.

Th following courses must be taken by all students:

36.101	Social Theory I	36.501	Thesis
36.102	Social Theory II	36.502	Thesis
36.111	Social Theory Methods I	25.101	Statistics in Psychology
36.112	Social Research Methods II		or
		21.320	Statistics

With the approval of the faculty advisor, a maximum of six semester hours of the thirty semester hours of credit required for the degree may be elected from graduate courses in other departments. With the approval of the faculty advisor, a maximum of eight semester hours of the thirty semester hours of credit required for the degree may be elected from advanced undergraduate courses.

Comprehensive Examination

This examination will be held in accordance with the general Graduate Division regulations.

DESCRIPTION OF COURSES

All courses carry three semester hour credits unless otherwise specified.

36.101   Social Theory I

Examination of ethnological theory with specific attention to its relevance for an understanding of cultural dynamics, social interaction, and social organization.   (Offered yearly, 1st semester)

36.102   Social Theory II

Several different approaches, Positivistic Oranticism, Conflict Theory, Social Behaviorism, Formalism, and Functionalism will be examined. Their contribution to our understanding of social change and the relationship between the individual and society will be reviewed.

(Offered yearly, 2nd semester)

36.111   Social Research Methods I

Survey of the literature will be supplemented by attention to problems of application in social research methodology. Topics will include coverage of documentary and bibliographical methods, interviewing techniques, participant-observation survey construction and execution and data analysis.   (Offered yearly, 1st semester)

36.112   Social Research Methods II

Concentration on giving of practical experience of principles learned in Methods I by participation in a variety of actual field projects.

(Offered yearly, 2nd semester)

36.121   Comparative Social Organization I

Comparison of folk and intermediate societies in terms of their variations in social organization; family and kinship structure, economics, political and religious systems. Attention is given to the way in which these societies contrast to industrial social systems.

(Offered 1965-66, 1st semester)

36.122   Comparative Social Organization II

Comparison of a number of industrial societies is made with a view toward understanding their common characteristics as well as their organizational and cultural differences. Attention is given to the implications of mass society, power structure, communications. Also the significance of ethnic variation in contemporary society will be considered.

(Offered 1965-66, 2nd semester)

36.131   Community Analysis I

Relationship of man to his environment. Ecological theories of spatial distribution and mobility. Development of the concept of community in relation to physical environment, member population, and social institutions. Analysis of rural communities and regions. Evaluation of rural community action programs.   (Offered yearly, 1st semester)

36.132   Community Analysis II

The ecology of urban and metropolitan communities. Analysis of urban community life in historical perspective. Urban population,

(Offered yearly, 2nd semester)

36.141   Social Deviancy

A social psychological interpretation of delinquency, alcoholism, and drug addiction will be developed on the basis of sociological and psychological theories of deviant behavior. Field trips to AA meetings and a boys' training school will be arranged out of class.

(Offered 1965-66, 1st semester)

36.151   Social Science in Medicine

Social science contribution to medicine and public health will be reviewed. Research in cross-cultural areas, community studies, family studies, studies of medical professions and institutions will be discussed. Specific projects in the local area that exemplify these fields will be examined in detail.   (Offered yearly, 1st semester)

36.161   Work and Society

The literature of various fields will be reviewed on the subject of work and society. The contributions of economic anthropology, industrial sociology and the psychology of occupations and careers will be discussed. Current research will be examined intensively.

(Offered yearly, 2nd semester)

36.401-36.402   Seminar

Discussion of selected topics in the field of sociology.   (Offered yearly)

36.411   Contemporary Issues

The study of contemporary issues in the field of sociology and anthropology. Supervised readings and written reports on special problems.

(Offered yearly, 1st semester)

36.412   Contemporary Issues

The study of contemporary issues in the field of sociology and anthropology. Supervised readings and written reports on special problems.

(Offered yearly, 1st semester)

36.501-36.502   Thesis

Thesis supervision by members of the Sociology-Anthropology Department.   (Offered yearly)

Graduate School
of
Business Administration

BUSINESS ADMINISTRATION PROGRAMS

The courses described in the following pages are divided into two major categories: required and elective. Elective courses fall into two sub-categories: general and functional. The course description indicates the nature of the material offered and the appropriate relationship of the individual course to the program as a whole.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level, and the University reserves the right to cancel any course for which an insufficient number of students apply. All courses carry two semester hours of credit unless specified otherwise.

The Master of Business Administration program at present is offered for part-time students, and therefore, the classes are given in the late afternoon and evening. The curriculum is described on the following pages.

A circular describing the courses to be offered during the first semester and giving the registration and interview dates is issued in July. A similar circular for the second semester is issued in December, and for the summer session one is issued in May. Courses of the summer session are not indicated within the section entitled "Description of Courses", but are chosen each year for both general and functional elective offerings.

ACADEMIC CALENDAR

May 1964—June 1965
Summer Session 1964

Interview and Registration Period	Monday-Saturday	May 27-June 8
Classes Begin	Monday	June 10
Independence Day, No Classes	Thursday	July 4
Classes End	Tuesday	July 30
Examination Period	Wednesday-Thursday	July 31-Aug. 1

First Semester 1964-1965

Registration Period for Former Students	Monday-Saturday	July 6-Sept. 19
Interview and Registration Period for New Students	Monday-Saturday	Aug. 24-Sept. 19
Labor Day, Office Closed	Monday	Sept. 7
Classes Begin	Monday	Sept. 21
Columbus Day, No Classes	Monday	Oct. 12
Veterans' Day, No Classes	Wednesday	Nov. 11
Thanksgiving Vacation	One Week	Nov. 23-Nov. 28
Classes Resume	Monday	Nov. 30
Christmas Vacation	Two Weeks	Dec. 21-Jan. 1
Classes Resume	Monday	Jan. 4
Classes End	Friday	Jan. 22
Examination Period	Monday-Friday	Jan. 25-Jan. 30
No Classes	Monday-Friday	Feb. 1-Feb. 6

Second Semester 1964-1965

Registration Period for Former Students	Thursday-Saturday	Jan. 4-Feb. 6
Interview and Registration Period for New Students	Monday-Saturday	Jan. 18-Feb. 6
Classes Begin	Monday	Feb. 8
Washington's Birthday, No Classes	Monday	Feb. 22
Patriots' Day, No Classes	Monday	Apr. 19
Classes End	Friday	May 14
No Classes	One Week	May 17-May 21
Examination Period	Monday-Friday	May 24-May 28

COMMITTEE ON GRADUATE STUDY
IN
BUSINESS ADMINISTRATION

Myron J. Spencer, A.B., M.A., Chairman   Director of the Graduate School of
Business Administration and Professor of Economics

Charles H. Dufton, A.B., M.A.   Professor of Marketing and Advertising
and Chairman of the Department

Joseph M. Golemme, S.B., M.A., C.P.A.   Professor of Accounting and
Chairman of the Department

Carlo E. Gubellini, B.S., M.B.A.   Assistant Dean of Business Administration

Roger S. Hamilton, A.B., M.A., Ph.D.   Dean of Business Administration

Morris A. Horowitz, A.B., Ph.D.   Professor of Economics
and Chairman of the Department

Lyman ʜ. Keith, B.S., M.A., M.B.A.   Professor of Business Management
and Chairman of the Department

Anghel N. Rugina, B.S., M.A., Ph.D.   Associate Professor of Finance

Albert Slavin, B.S., Ed.M., C.P.A.   Associate Professor of Accounting

Arthur A. Vernon, S.B., M.S., Ph.D.   Dean of the Graduate Division

William C. White, S.B., Ed.M., Eng.D.   Vice President
and Provost of the University

Edward R. Willett, B.S., M.A., Ph.D.   Professor of Finance
and Chairman of the Department

FACULTY

Dean S. Ammer
Professor of Management

Anker V. Andersen
Assistant Professor of Accounting

Seth A. Armen
Associate Professor of Accounting

Samuel Barres
Lecturer in Business Administration

Joseph A. Barry
Lecturer in Business Administration

Richard J. Barta
Lecturer in Business Administration

Clifford A. Bean
Lecturer in Business Administration

Irving M. Bonawitz
Associate Professor of Accounting

John E. Condon
Associate Professor of Economics

Joel Corman
Assistant Professor of Management

Ernest M. DeCicco
Assistant Professor of Management

James W. Earley
Lecturer in Business Administration

Ralph W. Fingar
Lecturer in Business Administration

Frederick V. Fortmiller
Lecturer in Business Administration

Bernard L. Friedman
Lecturer in Business Administration

Paul W. Glennon
Lecturer in Business Administration

Roger A. Golde
Lecturer in Business Administration

Bernard P. Goldsmith
Associate Professor of Management

Harold M. Goldstein
Assistant Professor of Economics

John J. Graham
Lecturer in Business Administration

Sidney Herman
Assistant Professor of Economics

Edward T. Keating
Lecturer in Business Administration

Pedro C. Leano
Associate Professor of
Management and Finance

Ivory Lyons
Assistant Professor of Economics

John E. Marshall
Lecturer in Business Administration

Daniel J. McCarthy
Lecturer in Business Administration

A. Howard Myers
Professor of Management

Robert G. Neville
Lecturer in Business Administration

Clement J. Nouri
Associate Professor of Management

Paul Norton
Lecturer in Business Administration

Edward V. Puopolo
Lecturer in Business Administration

Anghel N. Rugina
Associate Professor of Economics
and Finance

Harry A. Saunders
Lecturer in Business Administration

Gerald A. Simon
Lecturer in Business Administration

Albert Slavin
Associate Professor of Accounting

Leslie E. Woods
Lecturer in Business Administration

MASTER OF BUSINESS ADMINISTRATION DEGREE

Admission

To be enrolled for graduate work in business administration, applicants must have obtained a bachelor's degree from a recognized institution and may be required to take the Admission Test for Graduate Study in Business. The decision with respect to the Admission Test will be made after the applicant's transcript has been reviewed. A student whose undergraduate cumulative grade average is less than B (or equivalent in quality points) is advised to take the Admission Test for Graduate Study in Business before the interview with the Graduate School office. Information with respect to this test may be obtained by calling or writing the Graduate School of Business Administration.

Program

Before admission to the program, each applicant will be interviewed by the Director of the Graduate Business Administration Program. At this time the applicant's undergraduate preparation will be evaluated to determine whether deficiencies exist in the areas of mathematics, statistics, accounting, or economics. If any deficiencies exist, they may be made up by registration for special sections for graduate business students available in the University College at Northeastern University. Deficiencies in statistics and/or accounting must be made up before the student may enter required courses. Deficiencies in mathematics may be made up at any time before the student registers for a required or an elective course for which mathematics is a prerequisite. Deficiencies in economics must be made up before the student may register for the required courses in marketing and finance. A student who fails to pass the University College course in mathematics designated for graduate students will not be dropped from the Graduate School, but will be prohibited from taking any courses for which preparation in mathematics is specifically required. A student who fails to pass the University College courses in statistics or accounting designated for graduate students will not be allowed to register in any graduate business courses. A student who fails to pass the University College course in economics must arrange for an interview with the director of the program before registration for any course in which preparation in economics is specifically required.

Each student must take twenty semester hours of the required courses, as follows, but not necessarily in this order:

Required Courses

41.234	Control	43.214	Marketing II
42.231	Human Relations in Business Organizations I	44.209	Finance I
		44.210	Finance II
42.232	Human Relations in Business Organizations II	45.205	Manufacturing I
		45.206	Manufacturing II
43.213	Marketing I	50.206	Administrative Processes

In order to complete the degree requirements, ten semester hours of work must also be taken from elective courses with a maximum of six semester hours from any single functional area. These elective courses are as follows:

Functional Elective Courses

Finance

44.212	Investment Management
44.215	Financial Policy

Marketing

43.205	Marketing Policy
43.207	Industrial Marketing
43.241	Advertising Management
43.242	Marketing Research

Manufacturing

45.221	Manufacturing Policy I
45.222	Manufacturing Policy II
45.323	Factory Management

Human Relations

42.215	Industrial Relations I
42.216	Industrial Relations II

General Elective Courses

14.301	Quantitative Methods in Business and Economics I	20.205	Government Finance and Fiscal Policy
		20.206	Economic Development
14.302	Quantitative Methods in Business and Economics II	20.208	International Economic Relations
		20.211	Business Cycles and Forecasting
14.303	Statistical Techniques for Business Decision-Making	20.301	Managerial Economics
		45.208	Management of Small Enterprises
20.202	Case Studies in Business Enterprise	46.301	Business Law I
		46.302	Business Law II
20.204	Government and Business	46.303	Management of Intangible Corporate Assets

DESCRIPTION OF COURSES

Required Courses

41.234   Control   Prep. Managerial accounting or equivalent
An indispensable tool for better managerial control is the establishment
and operation of budgets. Requisites to successful budgeting and essen-
tial steps in budgetary control with the procedures for carrying out
budget policies will be studied. The work of the controller in obtaining
and organizing policies will be studied. The work of the controller in
obtaining and organizing the necessary data for managerial use will be
an essential part of the course.   (Offered yearly, 1st and 2nd semester)

42.231   Human Relations in Business Organizations I   Prep. Managerial
                                                accounting or equivalent
The basic purpose is to give the student an opportunity to develop a way
of thinking about human behavior in organizations that will enable him to
play an effective administrative role. Case studies; T-groups; organized
executive action with respect to internal human relations.
                (Offered yearly, 1st semester, and 1965-66, 2nd semester)

42.232   Human Relations in Business Organizations II

                                        Prep. 42.231 Human Relations in
                                                Business Organizations I
A continuation of 42.231 Human Relations in Business Organizations I
with emphasis on analysis of individual behavior. The objective is to give
the student an opportunity to improve his skill in understanding others
as well as his ability to communicate.
                (Offered yearly, 2nd semester, and 1964-65, 1st semester)

43.213   Marketing I   Prep. Basic economics and managerial
                                                accounting or equivalents
The objectives of this course are twofold: to provide the student with a
broad but comprehensive understanding of basic marketing functions,
institutions, and policies, and to develop the student's ability to recog-
nize and deal with marketing problems. Particular attention is placed on
defining the role of marketing in the economy as well as in the business
firm. Sections of the course cover the consumer, both ultimate and
industrial, product policy, channels of distribution, and pricing.
                (Offered yearly, 1st semester, and 1964-65, 2nd semester)

43.214   Marketing II   Prep. 43.213 Marketing I
A continuation of 43.213 Marketing I involving particularly marketing
situations examined from the marketing practitioner's point of view.
Advertising and sales promotion, personal selling, marketing research,
and an integrated marketing program will be considered.
                (Offered yearly, 2nd semester, and 1965-66 1st semester)

44.209   Finance I   Prep. Managerial accounting, statistics, and
economics or total equivalent

A study of the methods of selection and development of the optimum
financial structure for the business firm, dividend policy and dividend
payment procedure; organization for finance, including capital budgeting,
tax planning, long-range fiscal planning; financing for reorganization,
merger, and liquidation; international aspects of financial control; analy-
sis of financial statements and the significance of operating ratios.

(Offered yearly, 1st semester, and 1964-65, 2nd semester)

44.210   Finance II   Prep. 44.209 Finance I

A continuation of 44.209 Finance I involving analysis of security issues,
capital budgeting, sources of capital, corporate income, and control.

(Offered yearly, 2nd semester, and 1965-66, 1st semester)

45.205   Manufacturing I   Prep. Managerial accounting or equivalent

The problems of manufacturing operations as experienced on the plant
manager level. Reflecting the various elements involved in production
planning and control, it is concerned with the economics of production
when considering the aspects of specialization, simplification, standard-
ization, and diversification as well as expansion, contraction, and integra-
tion.   (Offered yearly, 1st semester, and 1965-66, 2nd semester)

45.206   Manufacturing II   Prep. 45.205 Manufacturing I

A continuation of 45.205 Manufacturing I, including such aspects of
production as materials, plant location and layout, power maintenance,
labor supply, organization, wage policy, and so forth, and concludes with
cases considering the controls of the manufacturing processes, i.e.,
product development, scheduling, inventory, quality, cost, and budgetary
controls.   (Offered yearly, 2nd semester, and 1964-65, 1st semester)

50.206   Administrative Processes   Prep. All required graduate courses

This course is concerned, at the top management level, with the problems
involved in the organizational and structural processes related to admin-
istrative and organizational operation. It presents an integrated approach
to the policy and planning function as it cuts across departmental lines
of control. Advantages and disadvantages of various types of organization
are explored and discussed in terms of optimum values involved.

(Offered yearly, 1st and 2nd semester)

Functional Elective Courses

FINANCE

44.212   Investment Management   Prep. 44.209 and 44.210,
Finance I and II

A review of investment objectives and a discussion of various methods of building an investment portfolio to achieve given objectives.

Emphasis will be placed on those aspects of security market operation which will be useful to the businessman and which will furnish background for those who may be interested in the brokerage business.

(Offered yearly, 1st and 2nd semester)

44.215   Financial Policy   Prep. 41.234 Control, 44.209 and
44.210 Finance I and II, mathematics, and statistics

Considers the technique of decision-making affecting the specific functions of financial management. An intensive analysis of business cases involving, among others, major financial policy issues including: design of the capital structure; cost of capital; capital budgeting and return on investment; sources of short-term, long-term, and equity capital; valuation associated with mergers and consolidation; and financial problems arising from reorganization.   (Offered yearly, 2nd semester)

MANUFACTURING

45.221   Manufacturing Policy I   Prep. 45.205 and 45.206,
Manufacturing I and II

Top management consideration of the responsibilities and function in organizing for, planning, and controlling the procedures of production. The course considers the modern tendencies of industrial development; specifically, integration, concentration, consolidation, specialization, standardization, and diversification. It includes a study of the consumptive demand to determine markets and what to manufacture; factors affecting the industrial site, such as accessibility to raw materials, adequate labor supply, transportation service and costs.

(Offered yearly, 1st semester)

45.222   Manufacturing Policy II   Prep. 45.221 Manufacturing Policy I

A continuation of 45.221 Manufacturing Policy I, including plan and design, construction and layout for effective production flow; selection of equipment; the coordination of output with demand; seasonal production; production planning; inventory control; quality control; procurement; cost control; methods of compensation of labor.

(Offered yearly, 2nd semester)

45.323   Factory Management   Prep. 45.205 and 45.206,
                                                                Manufacturing I and II

This course is designed to meet the needs of the individual who expects
to find himself in a position of line authority in a factory. Both large and
small firms are considered in a variety of industries. Cases and reading
assignments deal with day to day problems of the factory manager, the
middle management group, and the front line supervisor. Each case
presents a specific problem for which a definite solution must be reached,
often within a time limit. Emphasis is placed on solving immediate prob-
lems within the framework of existing policies by coordinating the re-
sources at hand.   (Offered yearly, 1st semester)

MARKETING

43.205   Marketing Policy   Prep. 43.213 and 43.214,
                                                                Marketing I and II

The student becomes a member of the management team of a manufac-
turing company, simulated in Northeastern's computer center, and is
faced with responsibility for formulating and implementing marketing
policies and with taking responsibility for the consequences in a com-
petitive environment. The relationshps between marketing policy, finance,
manufacturing and business policy are clarified. Readings and lectures
supplement the decision-making exercise.

                                        (Offered yearly, 1st and 2nd semester)

43.207   Industrial Marketing   Prep. 43.213 and 43.214,
                                                                Marketing I and II

The problems of industrial concerns in selling their products and serv-
ices to other industrial customers are studied first at the salesman's
level, then at the area manager's level and finally at the level of the
company sales executive. Emphasis is placed on determining the cus-
tomer's needs and finding ways to meet these needs. Areas covered
include the role of the purchasing agent, industrial salesmen's problems,
supervisory problems, product planning and marketing programs for
industrial products and services.   (Offered yearly, 2nd semester)

43.241   Advertising Management   Prep. 43.214 Marketing II

This course deals primarily with the formulation of advertising policy
and programs from a top management point of view. Emphasis is placed
on determining the "mix" of marketing elements, with emphasis on adver-
tising, that satisfies the particular situations of various businesses. The
objective of the course is not to train advertising technicians; rather it is
to give a viewpoint and training to those who may be required to for-
mulate, administer, or evaluate advertising and marketing programs.
Course work consists of readings, text material, and case discussions.
Both industrial and consumer goods advertising are covered.

                                                (Offered yearly, 1st semester)

43.242 Marketing Research   Prep. 43.214 Marketing II
The art of scientific investigation is applied to typical marketing problems such as product research, advertising, and sales control. A step-by-step procedure for defining a problem and carrying out the research necessary for its solution is developed. Special emphasis is given to motivation research and operations research techniques developed by social scientists and mathematicians for the solution of marketing problems.

(Offered yearly, 2nd semester)

HUMAN RELATIONS

42.215 Industrial Relations I   Prep. 42.231 and 42.232,
Human Relations in Business
Organizations I and II, Basic economics
The principles of personnel management and of management-union relations; policy considerations in the managing of manpower resources; the development of labor organizations and labor-management agreements; work rules and productivity: mediation and arbitration, and public policy as to labor disputes; political activities and public responsibilities of unions and management; labor markets, wage determination and employment opportunities.   (Offered yearly, 1st semester)

42.216 Industrial Relations II   Prep. 42.215 Industrial Relations I
The problem areas and practices of personnel management and management-union relations such as management authority and rights, union security, industrial discipline; standards of performance and compensation disagreements. Cases will be used for the exploration of stoppages and other supplements to collective bargaining, of management-union accommodation, of cooperation, and of planned consultative relationships. Role playing with student participation will be used along with other techniques for simulating actual management-union situations.

(Offered yearly, 2nd semester)

General Elective Courses

14.301 Quantitative Methods in Business and Economics I
Prep. Basic mathematics and statistics
Basic principles and techniques of operations research as applied in business and economics. These principles and techniques will be illustrated by simplified examples drawn from such areas as marketing, production management, transportation, and the determination of product mix. The major topics covered include the simplex method of linear programming and simulation and queuing theory. The presentation will be nonmathematical.   (Offered yearly, 1st semester)

14.302   Quantitative Methods in Business and Economics II

Prep. 14.301 Quantitative Methods in
Business and Economics I

Application of principles, techniques, and examples introduced in the first course to practical situations. Realistic problems, involving many variables, will be solved by employing the 1620 Computer. Students will be introduced to the FORTRAN language and will solve problems by writing their own computer programs. The presentation will be non-mathematical.   (Offered yearly, 2nd semester)

14.303   Statistical Techniques for Business Decision-making

Prep. 14.301 and 14.302, Quantitative
Methods in Business and Economics I and II

Securing adequate and reliable information for business decisions; quantitative techniques available for arriving at useful conclusions; making decisions under conditions of general uncertainty.

(Offered yearly, 1st semester)

20.202   Case Studies in Business Enterprise   Prep. Managerial
accounting or equivalent

A survey of the history of industrial endeavor and business activity from its rudimentary stages to the present day with careful attention to the evolution of business management, noting successful and unsuccessful examples by case history; discussion of the role that business plays in shaping our economy and society as well as the effect of our social and economic order upon the business firm; special emphasis is given to the control of business by the state, monetary policies, public finance, the rise of banks, corporations, commodity and stock exchanges, and their regulation and control.   (Offered yearly, 2nd semester)

20.204   Government and Business   Prep. Basic economics
or equivalent

The expanding scope of the government's economic and social activities is bringing about a much closer relationship between government and business. The course analyzes the role of government as a regulating force as well as the nature and impact of governmental fiscal, economic, and social policies upon the conduct of business. The political and economic philosophies behind greater government participation in the economic structure of the nation as indicated by public utility, anti-trust, and labor and social legislation.   (Offered yearly, 1st semester)

20.206   Economic Development   Prep. Basic economics
or equivalent

The enumeration, delineation, and assessment of variables which determine the level and the nature of economic activity. An introductory discussion of the economic factor in civilization is followed by an

examination of the psychological, social, and political influences on economic change. The role of various economic institutions in secular development is analyzed.   (Offered yearly, 2nd semester)

20.208   International Economic Relations   Prep. Basic economics
                                                                       or equivalent
This course will deal with two major areas: the rudiments of international economics and a survey of current problems in international relations. The topics in the first area include: theory of international trade; balance of payment problems; tariff policy and multilateral trade; capital movements. The topics in the second area include: problems of industrial countries versus undeveloped countries; institutions of international economic cooperation such as International Monetary Fund, World Bank, and Common Markets.   (Offered yearly, 2nd semester)

20.211   Business Cycles and Forecasting

                                             Prep. Mathematics, statistics and
                                                   basic economics or equivalent
The major business cycle theories are introduced together with a survey of the statistical history of fluctuations in business activity with particular reference to capitalism in the United States. Heavy emphasis on the techniques and weaknesses of forecasting; its importance to the economy, specific industries, and the individual firm.

                                                            (Offered yearly, 1st semester)

20.301   Managerial Economics   Prep. Mathematics, statistics and
                                                   basic economics or equivalent
An intensive analysis of the business firm with respect to demand, cost, capital, capital budgeting, and the implications of varying market structures for price-output relationships.   (Offered yearly, 1st semester)

20.303   Money and Banking   Prep. Basic economics
Money and credit institutions; expansion and contraction of credit; important monetary theories; and a critical evaluation of United States monetary and banking laws in the light of the theories discussed.

                                                            (Offered yearly, 1st semester)

20.305   Labor Economics   Prep. Basic economics
Labor and Public issues in the economy: the labor force; the labor movement; the collective bargaining process as an industrial factor; management-labor conflict; wages, benefit programs and income distribution; labor relations laws and labor standards legislation; unemployment, security and economic growth; unionism and democracy.

                                                    (Offered yearly, 1st and 2nd semester)

20.307   Government Finance and Fiscal Policy I   Prep. 20.303 or equiv. Governmental activities and expenditures; financing of government expenditure; income taxation; the consumption basis of taxation; the taxation of wealth and transfers of wealth; and the commercial principle.
(Offered yearly, 2nd semester)

20.308   Government Finance and Fiscal Policy II

Prep. 20.307 Government Finance
and Fiscal Policy I

Economics of government borrowing; alternative approaches to fiscal policy; fiscal policy and the business cycle; debt management.
(Offered yearly, 2nd semester)

46.301   Business Law I   Prep. At least one year of business
law or equivalent

An analytical study of the "Uniform Commercial Code" (now in effect in Massachusetts and five other states) which contains many changes in the legal rules affecting Negotiable Instruments, Sales of Goods, Bills of Lading, Warehouse Receipts, and other phases of business transactions.
(Offered yearly, 1st semester)

46.302   Business Law II   Prep. At least one year of business
law or equivalent

This course deals with several phases of business law not ordinarily covered in undergraduate courses. Topics covered include Real Property, Personal Property, Rights and Remedies of Creditors, Contract Restrictions and Restrictive Covenants, Business Torts, Business Crimes, and a survey of Federal regulation of business by administrative agencies such as the Federal Trade Commission, Interstate Commerce Commission, Securities and Exchange Commission, and the Federal Communications Commission.   (Offered yearly, 2nd semester)

50.208   Management of Small Enterprises   Prep. Basic accounting
                                                                            or equivalent

Analysis of all phases of operation of a small business, including selection of field or product, organizing, financing and setting up a small business, sales strategy, credit operations, cash flows, cost controls, and profit planning, primarily through discussion of small business organization cases.   (Offered yearly, 1st and 2nd semester)

50.303   Management of Intangible Corporate Assets   Prep. 43.213
                                                               and 43.214, Marketing I and II

Nonoperating income possibilities from research and development; intrinsic value and uses of business know-how, trade secrets, proprietary data; foreign and domestic licensing (patents; know-how, trade-marks) including government contracts; copyright clauses; use of intellectual business property as medium for market penetration or new business development; maximum utilization of corporate intangible resources to improve the profit picture.   (Offered yearly, 1st semester)

*Graduate School
of
Education*

EDUCATION PROGRAMS

A full-time graduate program in education is available for those who wish to obtain a Master of Education degree. To be admitted to full-time study, candidates must submit an application by April 1 to be approved for first semester enrollment and by November 1 for second semester enrollment. In addition, interviews are required with the Director of the Graduate School of Education and the Committee on Graduate Study in Education.

A late afternoon and evening program is available for those who wish to obtain the Master of Education degree by part-time study. All part-time students must have an interview with the Director or the Graduate School of Education at the time of their first registration.

Students in any program who are graduates of colleges which are not members of a regional association will be expected to take the Graduate Record Examination and submit evidence of general qualifications before being admitted to degree candidacy.

Individualized programs are offered which are consonant with the varied professional goals of students. Graduate students with teaching experience are afforded an opportunity to prepare themselves for service in specialized areas such as guidance, administration, and reading. Teachers wishing to increase their subject matter competence may, if qualified, elect a large portion of their program from offerings in liberal arts or business administration. Students lacking certification may prepare themselves to enter the teaching profession. An opportunity for supervised student teaching is available.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level, and the University reserves the right to cancel any course for which an insufficient number of students apply.

A circular describing the courses offered during the first semester and giving the registration and interview dates is issued in August. A similar circular for the second semester is issued in December, and for the summer session one is issued in May.

ACADEMIC CALENDAR

June 1964-1965

Summer Session 1964

Interview and Registration Period	Monday-Saturday	June 8-June 20
Classes Begin	Monday	June 22
Independence Day, No Classes	Saturday	July 4
Classes End	Friday	July 24
Examination Period	Monday-Friday	July 27-July 31

First Semester 1964-1965

Registration Period for Former Students	Monday-Saturday	July 6-Sept. 19
Interview and Registration Period for New Students	Wednesday-Saturday	Aug. 31-Sept. 19
Labor Day, Office Closed	Monday	Sept. 7
Classes Begin	Monday	Sept. 21
Columbus Day, No Classes	Monday	Oct. 12
Veterans' Day, No Classes	Wednesday	Nov. 11
Thanksgiving Vacation	One Week	Nov. 23-Nov. 28
Classes Resume	Monday	Nov. 30
Christmas Vacation	Two Weeks	Dec. 21-Jan. 2
Classes Resume	Monday	Jan. 4
Classes End	Friday	Jan. 22
Examination Period	Monday-Friday	Jan. 25-Jan. 30
No Classes	Monday-Friday	Feb. 1-Feb. 6

Second Semester 1964-1965

Registration Period for Former Students	Monday-Saturday	Jan. 4-Feb. 6
Interview and Registration Period for New Students	Monday-Saturday	Jan. 18-Feb. 6
Classes Begin	Monday	Feb. 8
Washington's Birthday, No Classes	Monday	Feb. 22
Spring Vacation	One Week	Apr. 19-Apr. 24
Classes End	Saturday	May 29
Memorial Day, Office Closed	Monday	May 31
Examination Period	Monday-Friday	June 1-June 5

COMMITTEE ON GRADUATE STUDY
IN
EDUCATION

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Raymond C. Dethy, B.Sc., M.A., Ph.D. — Assistant Professor of Education

Charles F. Haley, B.S., Ed.M. — Associate Professor of Education and Director of Student Teaching

Lester S. Vander Werf, A.B., M.A., Ed.D — Dean of Education

Arthur A. Vernon, S.B., M.S., Ph.D. — Dean of the Graduate Division

William C. White, S.B., Ed. M., Eng. D. — Vice President and Provost of the University

FACULTY

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Lecturer in Education

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Assistant Professor of Psychology

Wendell R. Brown
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Department of Foundations of
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Stephen J. Golburgh
Assistant Professor of Education

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Associate Professor of Education
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Manasori Higa
Assistant Professor of Education

Melvin Howards
Assistant Professor of Education
and Director of Center for
Reading Improvement

Albert W. Koch
Lecturer in Education

Robert S. Lang
Associate Professor of Graphic
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John H. Lawson
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Saul Rogolsky
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Joseph Spear
Professor of Mathematics

Bernard Stotsky
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Frank E. Truesdale
Assistant Professor of Graphic
Science

Lester S. Vander Werf
Dean of Education and Professor
of Education

William James Vaughn, Jr.
Lecturer in Education

Albert C. Williamson
Lecturer in Education

MASTER OF EDUCATION DEGREE

Admission

To be enrolled for graduate work in education, applicants must have obtained a bachelor's degree from a recognized institution.

Credit and Course Requirements

In satisfying the requirement for a minimum of thirty semester hours, at least twelve courses must be included in the student's program.

Program of Study

Programs are available for experienced teachers and for persons desiring certification as elementary or secondary teachers. Before a student registers for the first time, his professional objectives will be determined, and a program to achieve these objectives will be prepared. For this purpose, an interview with the Director of the Graduate School of Education is required.

Approval by the Director of the content and sequence of all graduate programs must be obtained. Any change in a student's program must have the prior approval of the Director.

Persons not planning to pursue a degree program may, with the approval of the Director, register for courses upon satisfactory evidence of a bachelor's degree.

Programs for Experienced Teachers

A student may register for one or two courses prior to his acceptance into a program. Before a student may register for a second semester of study, he must complete a formal application and complete the Miller Analogies Test administered by the Northeastern University Testing and Counseling Center. An interview with the Committee on Graduate Study in Education may also be required.

Applicants who possess a valid teaching certificate and are admitted to study for the Master of Education degree may specialize in one of the following areas:

School Administration	Reading
Guidance	Liberal Arts Emphasis

Graphic Science

All students are required to complete the following courses:

21.306	Psychology of Learning and Thinking
21.340	Research Methods in Education
21.401	Social Foundations of Education
21.402	Social Foundations of Education

All students must complete one of the programs as outlined in the following pages. Any variations or changes must have the prior approval of the Director of the Graduate School of Education.

SCHOOL ADMINISTRATION

21.306	Psychology of Learning and Thinking
21.340	Research Methods in Education
21.401	Social Foundations of Education
21.402	Social Foundations of Education
21.200	Introduction to Educational Administration
21.201	Curriculum Development, Supervision and School-Community Relations
21.202	School Staff and Pupil Personnel Administration
21.203	Principles of Administrative Organization, School Finance, and School Business Management Practices
	Four elective courses

Students specializing in School Administration are strongly urged to chose electives among the following courses as they are pertinent to their specific administrative goals.

21.204	The School Principalship
21.205	Simulated Administrative Workshop
21.206	Field Study Practicum in School Administration
21.210	Curriculum of the American Secondary School
21.212	Curriculum of the American Elementary School

GUIDANCE

21.306	Psychology of Learning and Thinking
21.340	Research Methods in Education
21.401	Social Foundations of Education
21.402	Social Foundations of Education
21.322	Tests and Test Procedures
21.371	Foundations of Guidance
21.373	Occupational Information
21.374	Counseling I
21.375	Counseling II
21.304	Mental Health
	or
21.309	Group Development
21.376	Practicum in Guidance
	One elective course

READING

21.306	Psychology of Learning and Thinking
21.401	Social Foundations of Education
21.402	Social Foundations of Education
21.256	Introduction to Remedial Reading: Elementary level or
21.257	Introduction to Remedial Reading: Secondary Level
21.258	Diagnosis and Correction of Reading Disability
21.259	Diagnosis and Correction of Reading Disability
21.262	Practicum in Reading
21.263	Research in Reading

Four elective courses.

LIBERAL ARTS EMPHASIS PROGRAM

21.306	Psychology of Learning and Thinking
21.340	Research Methods in Education
21.401	Social Foundations of Education
21.402	Social Foundations of Education
21.475	History of Educational Thought
21.476	History of Educational Thought

Six elective courses

These electives must be chosen from the offerings of Arts and Sciences, Business Administration, or Engineering. Students should confer with the Director in planning these courses.

GRAPHIC SCIENCE

21.306	Psychology of Learning and Thinking
21.340	Research Methods in Education
21.401	Social Foundations of Education
21.402	Social Foundations of Education
21.121	Descriptive Geometry Analysis
21.124	Machine Drawing and Design
21.125	Graphical Analysis

Students specializing in Graphic Science are strongly urged to choose electives from the following courses as they are pertinent to their needs and interests:

21.126	Electrical and Electronic Graphics
21.127	Graphics in Architecture
21.128	Creative Projects in Graphics

Three elective courses.

Students lacking basic skills and knowledge in graphic science may be asked to complete certain work before taking the required graphics courses.

Programs for Inexperienced Teachers

Applicants who do not possess a valid teaching certificate may be enrolled in a program designed to prepare them for service in either the elementary or secondary school. Since all professional certifications require a teaching certificate, persons desiring to enter the profession for the first time should enroll in one of these programs.

A student may register for one or two courses prior to his acceptance into a program. Before the end of the first semester of study, all students must complete the application form, take the Miller Analogies Test administered by the Northeastern University Testing and Counseling Center, and be interviewed by the Committee on Graduate Study in Education, who must approve the formal acceptance of students into certification programs. Part-time students will be expected to complete two semesters and a summer session of study prior to student teaching.

Program of Studies

If courses in general psychology, principles of teaching, child psychology, or adolescent psychology have not been taken previously, applicants may be required to take such work in addition to degree requirements. Such courses are designated as Group One courses and carry graduate credit but may not be included in a degree program. The Director of Graduate Programs in Education will determine when Group One requirements have been satisfied.

PROGRAMS

SECONDARY EDUCATION

1.		Specialized Methods in the major subject area	3 s.h.
2.	21.306	Psychology of Learning and Thinking	3 s.h.
3.	21.340	Research Methods in Education	3 s.h.
4.	21.401	Social Foundations of Education	3 s.h.
5.	21.402	Social Foundations of Education	3 s.h.
6.	21.321	Measurement and Evaluation	3 s.h.
7.	21.210	Curriculum of the American Secondary School	3 s.h.
8.		Elective	2 or 3 s.h.
9.		Elective	2 or 3 s.h.
10.		Elective	2 or 3 s.h.
11. 12.		Student Teaching	6 s.h.

Student Teaching Prerequisites

All Group One requirements, 21.306 Psychology of Learning and Thinking and the specialized methods in the major subject area are prerequisites to student teaching.

ELEMENTARY EDUCATION

1.		Specialized Methods	3 s.h.
2.		Specialized Methods	3 s.h.
3.		Specialized Methods	3 s.h.
4.		Specialized Methods	3 s.h.
5.	21.306	Psychology of Learning and Thinking	3 s.h.
6.	21.340	Research Methods in Education	3 s.h.
7.	21.401	Social Foundations of Education	3 s.h.
8.	21.402	Social Foundations of Education	3 s.h.
9.	21.212	Curriculum of the American Elementary School	3 s.h.
10.	21.321	Measurement and Evaluation	3 s.h.
11. 12.		Student Teaching	6 s.h.

Student Teaching Prerequisites

All Group One requirements, 21.306 Psychology of Learning and Thinking, and two specialized methods courses are prerequisites to student teaching.

DESCRIPTION OF COURSES

All courses carry three semester hour credits unless indicated otherwise.

GROUP I COURSES

21.220   Principles of Teaching

An exploration of the factors involved in effective teaching. Emphasizes the basic need for understanding of the learner and the learning process. Considers the improved methods of organization and evaluation in modern instructional programs.

(Offered yearly, 1st and 2nd semesters, and summer)

21.301   Child Psychology

A study is made of the child as he develops from infancy through the elementary school years. The primary emphasis is upon his emotional, social, and intellectual development. Physical development is discussed only in its relation to these other factors. The child is considered in his home and peer environment as well as in the school environment. Case history material is studied. Some attention is paid to the theoretical formulations of child behavior.

(Offered yearly, 1st semester, and summer)

21.303   Adolescent Psychology

Social, emotional, and intellectual development is traced through the junior and senior high school. Problems in family relationships and in the adolescent's social environment are considered as well as his adjustment in school. Case history material is included.

(Offered yearly, 2nd semester, and summer)

GROUP II COURSES

21.120   Principles and Teaching of Projection Theory

Orthographic, axonometric, oblique and perspective projection theory. The multi-view system including successive principal auxiliary and oblique views. Systematic methods for interpreting multi-view drawings.

(Offered 1964, summer)

21.121   Descriptive Geometry Analysis   Prep. 21.120, Principles and Teaching of Projection Theory or equivalent

Application of successive principal, auxiliary and oblique views in the study of angularity, parallelism, perpendicularity, intersections, tangency, and surfaces in three dimensions.   (Offered 1964-65, 1st semester)

21.122   Graphics, Geometry and Mathematics

Relationship between graphical methods, geometry, and elements of algebra and trigonometry. Locus concepts applied to conics and other technical cures. Foncharal scales and their relation to technical charts, slide rules and elementary nomography.

(Offered 1964-65, 2nd semester)

21.123   Principles and Teaching of Technical Drawing

Selection of views, sections and conventions, dimensions and specifications for shop working detail and assembly drawings.

(Offered 1964-65, 1st semester)

21.124   Machine Drawing and Design   Prep. 21.123 Principles and Teaching of Technical Drawing or its equivalent

Basic production processes, common machine elements, working detail and assembly drawings and their relationships to the design of operating devices.   (Offered 1964-65, 2nd semester)

21.125   Graphical Analysis   Prep. 21.122 Graphics, Geometry, and Mathematics or its equivalent

Curve fitting and emperial equations; design of more advanced slide rules and nomographs; graphical differentiation and integration; vector geometry and elementary mechanism analysis.

(Offered 1965-66, 2nd semester)

21.126   Electrical and Electronic Graphics   Prep. Approval of Instructor

Graphics as used in the design and presentation of electrical, electromechanical and electronic devices including common symbols, specialized charts and diagrams.   (Offered 1964-65, 1st semester)

21.127   Graphics in Architecture   Prep. Approval of Instructor
Graphics as used in the design and development of architectural struc-
tures. From preliminary sketches to final presentation including site
planning, detailed working drawings, delineation, entourage, etc.

(Offered 1965-66, 1st semester)

21.128   Creative Projects in Graphics   Prep. Approval of Instructor
Individually approved, graphics-related projects requiring the definition,
analysis and research of a problem and the design development and
final presentation of a solution. Problems of academic, pedagogical, con-
struction, interdisciplinary, research, etc. nature may be investigated.

(Offered 1964-65, 2nd semester)

21.141   Review of High School Mathematics I
This is a review of the principal topics of high school mathematics and
is intended primarily to help those who have had previous training in
mathematics and who wish a review in order to teach in high school. The
course may also be of help to those who have been away from teaching
for some years and now wish to return to it, as methods of presentation
will also be stressed.

The topics will include the laws of reasoning underlying the basic opera-
tions of our number system; fractions, decimals, per cent; fractions in
algebra; factoring and its uses; exponents and radicals; logarithms; pro-
gressions; series; solution of equations; determinants; complex numbers;
important theorems from theory of equations.

(Offered yearly, 1st semester)

21.142   Review of High School Mathematics II
The basic facts and concepts of geometry; evaluation of formulas; pro-
portion and variation; trigonometry; analysis of verbal problems; func-
tions and graphs; fundamentals of plane analytic geometry; locus prob-
lems; introduction to differential and integral calculus. If time permits,
the concept of sets will be introduced.   (Offered yearly, 2nd semester)

21.200   Introduction to Educational Administration   Prep. This course
is a prerequisite for all other offerings
in educational administration.
The course is designed to provide a broad panoramic view of the con-
ceptions, purposes, and functions of educational administration and a
careful look at the role of the educational administrator. Students will
be expected to read broadly regarding the tasks of the administrator and
react in such ways that can aid their making a commitment to subsequent
and more specific graduate work in the profession. The recommendation
of the instructor of this course and the head of the department of in-
struction will be a requirement for formal acceptance into the M.Ed.
graduate program for students wishing to major in educational ad-
ministration.   (Offered yearly, 1st and 2nd semesters, and summer)

21.201 Curriculum Development, Supervision, and School-Community Relations Programs Prep. 21.200 Introduction to Educational Administration

An interrelated approach to looking at patterns of curriculum development, supervision of the schools' instructional programs, and school-community relations programs will be the focal point of this course. Assessing the pertinent relationship between modern approaches, research findings, and current practices in the field will be utilized as the study technique of these facets of the educational administrator's responsibilities. Students will be expected to analyze critically various issues that currently face educational administrators in the areas of study. (Offered yearly, 1st semester)

21.202 School Law, Staff and Pupil Personnel Administration Programs Prep. 21.200 Introduction to Educational Administration

Development of a basic understanding of federal and state laws that are applicable to education and educational personnel as well as the legal prerogatives available to local boards of education. The role of the administrator in the legislative process is a basic consideration. Purposes, patterns, and issues in Staff and Pupil Personnel administration programs, including merit salary schedules are major considerations of the course. (Offered yearly, 2nd semester)

21.203 Principles of Administrative Organization, School Finance, and School Business Management Practices Prep. 21.200 Introduction to Educational Administration

The practices and issues in school business management on both the school district and school unit levels. The study of school finance includes the rationale for public support of schools, a look at selected state aid programs and current practices and issues of local support patterns in public education. Patterns of administrative organization, including discussions of formal and informal types of organization, staff and live relationships and a look at decision-making as an administrative process are emphasized. Readings will be taken from government and industrial management sources as well as educational administration.

(Offered yearly, 2nd semester)

21.204 The School Principalship Prep. 21.200 Introduction to Educational Administration

The total responsibilities of the school principal will be considered in this course. School unit administrative principles and practices will be presented that are common to both elementary and secondary school positions. In certain cases, differences between elementary and secondary practices such as developing the daily schedule, assignment and utilization of special teachers and administering the co-curricular activities program will be discussed. (Offered yearly, 1st semester)

21.205   Simulated Administration Workshop   Prep. 21.200
Introduction to Educational Administration or permission
of the workshop director if a practicing administrator wishes
to enroll (limited to an enrollment of 15 students)

This workshop is designed to place each student in a simulated decision-making situation. Background materials have been prepared which describe all aspects of a fictitious school system including its publics, its policies, its certificated and non-certificated staff members and its geographical and socio-economic make-up. These background data are disseminated through motion pictures, film strips, taped interviews with influential people in the fictitious community as well as through written materials.

After study and discussion of the background materials, each workshop participant will be given various "in-baskets" (each of which represents thirty or more problems that typically face a school administrator in the course of his career). The participant will have the opportunity to react to each of the problems in terms of the data about the school district and his own personal understanding of the issues involved. Time will be given for the workshop participants to discuss their solutions of the problems with the instructor and guest administrators currently in the field. Other selected administrative practices and problems will also be presented for discussion and reaction by outstanding administrators.
Credit: 6 semester hours.   (Offered yearly, summer)

21.206   Practicum in Educational Administration   Prep. 21.200
Introduction to Educational Administration
The Practicum may be substituted for any two
of the required courses offered

The Practicum is a field service experience for candidates with outstanding potential as school administrators. Students will be involved in aiding the administration of a public school system to survey its educational program and administrative policies and practices. Data gathering, interpretation and recommendations will be made to the superintendent for the solution of selected problems.

This experience should aid the students to develop a broader, first-hand knowledge of the role and expectations of general school administration. Selected lecture materials and personnel will be used to build academic competencies needed to work successfully with the problems at hand.

The Practicum will meet formally for a four hour period once each week for two semesters. Credit: 9 semester hours.
(Offered only as a two semester sequence—by invitation only)

21.210   Curriculum of the American Secondary School

This course is designed for in-service and prospective teachers, principals, and supervisors who seek experience and assistance in dealing

with such problems as the following: improving and enriching the subject curriculum; developing a core curriculum; general and special education; planning integrated units of work; providing for skill learning in an experience curriculum; co-operative development of criteria for curriculum evaluation; and effective use of evaluative criteria for secondary schools.
(Offered yearly, 2nd semester)

21.212   Curriculum of the American Elementary School

Consideration will be given to actual teaching situations as they exist in the modern elementary classroom, and emphasis will be placed on specific situations contributing to effective learning, sound curriculum-building, and evaluation. This course is open to teachers, supervisors, principals, and others interested in the modern elementary school program.   (Offered 1964, summer)

21.230   Student Teaching with Related Seminar

(See requirements under Student Teaching)

Here the student is provided opportunity in a public school to assume responsibility for organizing learning experiences in his major area under expert supervision. Separate seminars for elementary and secondary majors meeting weekly will run concurrently with the student teaching period and deal with problems encountered in the classroom. Credit: 6 semester hours.   (Offered yearly, 1st and 2nd semesters)

21.241   Mathematics at the Elementary Level I

Included in the course are methods of teaching arithmetic for meaning and topics designed to furnish a foundation in mathematics appropriate for any contemporary program: sets, pre-number ideas, numeration systems, place value, whole numbers, sentences, the number lines, and elementary geometric concepts.   (Offered yearly, 1st semester)

21.242   Mathematics at the Elementary Level II

Building on the material of the first course, this course includes methods and topics appropriate for contemporary upper-grade programs in mathematics; factors and primes, rational numbers, decimal numerals, ratio, rate, per cent, congruence and similarity, area and volume.

21.243   The Teaching of General Business Subjects

This course investigates current trends in the teaching of social business subjects, such as general business, economics, economic geography, business law, and consumer education. Objectives, nature of subject matter, teaching aids and devices, tests and measurements, textbooks, and supplementary materials are studied.

(Offered 1964-65, 1st semester)

21.245   The Teaching of High School Science I

The first half of a two semester course, principally for secondary school teachers. Problems of observations of scientific facts, their discovery, the derivation of scientific principles from elaboration of hypotheses, experimentation and reasoning with these facts will be analyzed in terms of the learning process. The different fields of science will be considered, stressing especially their interdependence and their unity of methods and of reasoning. Stress will be laid upon an historical consideration of the development of certain important concepts that particularly well illustrate the development and foster an understanding of the nature of science.

(Offered yearly, 1st semester)

21.246   The Teaching of High School Science II

A continuation of 21.245. During the second half of the course plans for modern science courses in various fields will be elaborated.

(Offered yearly, 2nd semester)

21.247   The Teaching of English in the Secondary School

A basic methods and materials course designed to strengthen the teacher's understanding of the role and function of English in the curriculum. Emphasis will be placed upon literature and language skills including grammar, composition, spelling, and reading. The course will include a review, analysis, and evaluation of current materials in secondary school English, and students will be assisted in the preparation and presentation of effective lesson plans.

(Offered yearly, 1st semester)

21.248   The Teaching of Modern Languages in the Secondary School

Through the case method and group discussions, the most effective types of class activities, subject unit presentation, assignments, examinations, teaching aids, used in modern language will be considered. The role of the language laboratory with its problems of selecting equipment, scheduling pupils, planning tapes and content of drill exercises, evaluating results and coordinating its functions with conventional classroom instructions will be discussed and demonstrated.

(Offered yearly, 1st semester)

21.249   The Teaching of Social Studies

A study of developments in methods, materials, and curriculum. Consideration wil! be given to such topics as the following: the teacher of the social studies; objectives of social studies instruction; social studies programs; controversial issues; current events; visual and auditory aids; field trips; evaluation. These and others will be studied in their relation to the experiences and interests of the members of the class. Particular emphasis on the role of the social studies in education for citizenship.

(Offered yearly, 1st semester)

21.251   Teaching Reading and Language Skills: Elementary Level

Basic developmental reading-language skills course for elementary teachers. Essential reading, writing, speaking, and listening skills are presented and analyzed in the light of the most recent concepts of integrated learning at various grade levels. Practical work in developing well-integrated reading-language skills plans for classroom use with average and above-average pupils will be emphasized.

(Offered yearly, 1st semester, and summer)

21.256   Introduction to Remedial Reading: Elementary Level

The first course in the reading specialization sequence. A description and analysis of the reading processes in retarded readers. A review and evaluation of basic causes of reading retardation, emphasizing the psycholinguistic approach. The primary objective of this course is to introduce the classroom teacher or prospective reading specialist to the nature of the remedial or retarded reader and to the essential processes and skills involved in word recognition and meaning areas.

(Offered yearly, 1st and 2nd semesters, and summer)

21.257   Introduction to Remedial Reading: Secondary Level

The first course in the reading specialization sequence. A description and analysis of the reading process in retarded junior and senior high school pupils. A review and evaluation of the basic causes of reading-language-study skills retardation, emphasizing the psycholinguistic approach. Study of problems in the areas of speed, meanings, including comprehension and interpretation; organization will be emphasized although some time will be devoted to considering some word recognition problems. The primary aim of this course is to familiarize the secondary school teacher or prospective reading specialist with the nature of the adolescent remedial reader and with the nature of typical reading-language-study problems.   (Offered yearly, 1st semester, and summer)

21.258   Diagnosis and Correction of Reading Disability   Prep. 21.251 The Teaching of Language Arts in the Elementary School and 21.256 Introduction to Remedial Reading: Elementary Level, or 21.257 Introduction to Remedial Reading: Secondary Level

First half of two-semester sequence for the reading specialist at elementary or secondary levels. A functional approach to diagnosing specific reading, language, and study problems at all levels, integrated with successful corrective measures. Individual and group techniques will be investigated and practiced with retarded readers. Many standardized and informal testing devices will be used and evaluated including reading, vocabulary, achievement, and intelligence tests; practice with such equipment as the audiometer, telebinocular, pacing devices, and other diagnostic tools will be offered.

A log or journal representing a comprehensive diagnostic and corrective program carried on with individuals and small groups during the year will be submitted and evaluated. (Offered yearly, 1st semester)

21.259   Diagnosis and Correction of Reading Disability   Prep. 21.258
Diagnosis and Correction of Reading Disability
Second half of a two-semester sequence for the reading specialist at elementary or secondary level, with greater emphasis on corrective work with retarded readers. (Offered yearly, 2nd semester)

21.262   Practicum in Reading   Prep. Approval of instructor required
For all prospective reading specialists at all levels. Demonstrations of remedial techniques in various skills at all grade levels. Actual lessons with various types of remedial readers, in small groups, will be presented, analyzed, and evaluated. New techniques, methods, and materials will be presented and discussed. (Offered yearly, 2nd semester)

21.263   Research in Reading   Prep. Approval of Instructor required
Last course in the reading specialization sequence. Both elementary and secondary specialists included. A survey of research techniques including basic statistical concepts necessary for research, experimental design, data collection and interpretation. Focus on reading research at elementary or secondary level in one general area.

A specific topic will be selected and at least ten pieces of pertinent research will be evaluated. Also a research proposal will be submitted which will indicate a thorough knowledge of research procedures and skills as well as knowledge of a particular problem in reading.

(Offered yearly, 2nd semester)

21.277   Concepts of Modern High School Mathematics I
Selected topics from U.I.C.S.M. and S.M.S.G. seventh, eighth and ninth grade textbooks, including: number systems, groups, rings, and fields, numeration, modular arithmetic, inductive and deductive reasoning, sets, mathematical statements, and proofs. (Offered yearly, 1st semester)

21.278   Concepts of Modern High School Mathematics II
Selected topics from S.M.S.G. tenth and eleventh grade textbooks, including: plane and space coordinates, vectors, polygons, circles, polyhedrons, spheres, number systems, function concepts, logarithms, exponents, and trigonometric functions. (Offered yearly, 2nd semester)

21.281   Principles of Programed Instruction
An examination of the development and current status of self-instructional devices. The course will include a survey of available programs and teaching machines, but emphasis will be placed on the details of the construction evaluation of programs. (Offered yearly, 1st semester)

21.304   Mental Health

Examination and study of conditions leading to the most effective social adjustment. Consideration will be given to the relationship between the maturation process and mental health, the predeterminants of maladjustment and its prevention, and will place special stress on those factors that encourage the attainment of emotional maturity. Some time will be given to a study of community mental health programs. Information bearing on mental health from the fields of psychiatry, psychology, sociology, physiology, and medicine will be synthesized and evaluated. This course should be of interest to teachers, personnel and guidance workers, psychologists, social workers, rehabilitation therapists, and other groups.   (Offered yearly, 2nd semester)

21.306   Advanced Psychology of Learning and Thinking

Prep. Introductory Psychology or its equivalent
Through the examination and discussion of pertinent research and theories, this course provides an understanding of the psychological principles involved in effective learning and thinking. Consideration is given to such topics as kinds of learning, concept formation, the role of organizational factors, emotional and motivational factors, retention, and language development.

(Offered yearly, 1st and 2nd semester, and summer)

21.307   Abnormal Psychology I

This is a two-semester course designed for educators and others concerned with the ways in which personality may become disordered. A careful survey of theories of personality development will serve as a base for discussing the malfunctioning personality as seen in the possible types of problems that may occur at various levels of development. Particular attention will be paid to problems of a neurotic nature and the types of defensive processes and attempts at problem solution that are noted. Case studies and films will serve as illustrations wherever possible.   (Offered 1964-65, 1st semester)

21.308   Abnormal Psychology II   Prep. 21.307

Abnormal Psychology I or its equivalent
This course will continue to examine the etiology and symptoms of the more serious personality disorders. Such problems as conduct disorders, psychosomatic disorders, and psychoses will come under discussion. The current methods of clinical diagnosis and treatment will be reviewed. Case studies will be integrated with lectures and discussed.

(Offered 1964-65, 2nd semester)

21.309   Group Development

Emphasis in this course will be directed toward understanding the deeper questions of group growth, behavior, and action fundamental

to developing solutions to the complex problems of group life. Students will learn to act as a group, to act democratically, to examine their strengths and weaknesses, to make group decisions, to become alert to new ideas and actions, to discover the pulse of a group, and why one group is productive while another is nonproductive. The group will examine intensively such areas as group process, sociodrama, sociometric techniques, attitude testing, social action project development, and communication blocks in human relations. (Offered yearly, 1st semester)

21.312 The Emotionally Disturbed Child

Educators will study identification techniques for regular classroom use. Diagnostic procedures and referral agencies will be explored. Skills to be employed in helping the emotionally disturbed child who remains in the regular classroom will be developed. An analysis will be made of problems of administration and participation in a team situation where emotionally disturbed children function in a segregated group.

(Offered 1965-66, 2nd semester)

21.320 Statistics

A first course in the statistical techniques uesd in educational research and in psychological testing. Measures of central tendency, variability, correlation, chi square, analysis of variance, and multiple regression will be among the topics considered. The student's mathematical background need not be beyond elementary algebra.

(Offered yearly, 1st semester)

21.321 Evaluation and Measurement

Emphasis in this course is on evaluation techniques and principles for use in the classroom at all levels. Attention will be given to the importance of establishing teaching objectives as a basis for evaluation. A brief review of statistical techniques necessary for dealing with objective type test scores and marking procedures will be included. Considerable emphasis will be placed on improving teacher-made tests, especially objective tests, and the student will be required to construct an objective test in his teaching field. Other evaluation techniques, besides tests, will also be reviewed. Brief attention will be given to standardized tests of achievement and ability as they may be used in evaluation of pupil progress. Students in the certification program will take this course rather than Tests and Test Procedures.

(Offered yearly, 2nd semester)

21.322 Tests and Test Procedures

The principles and problems of psychological testing as applied to the field of education in general, and guidance in particular, are discussed. Some consideration is given to elementary statistical concepts as they apply to the treatment, use, understanding, and interpretation of test

scores. Selection of tests for system-wide use is discussed. The student is made familiar with some of the currently used tests of intelligence, scholastic aptitude, differential aptitudes, achievement, interest and personality. Emphasis is placed on evaluating tests for use in education and guidance. Problems of test interpretation are discussed briefly.

(Offered yearly, 1st semester and summer)

21.323   Measurement of Intelligence   Prep. 21.322 Tests and
Test Procedures or approval of instructor

Deals with the nature of intelligence and its individual measurements using standardized techniques. Major emphasis is on the administration, scoring, and interpretation of the Stanford-Binet (Form L-M), and a certificate will be issued to those who complete the testing requirements under supervision. Other individual tests will be discussed, including the Wechsler Scales, and consideration will be given to the intellectual evaluation of individuals presenting special problems.

(Offered yearly, 1st semester)

21.324   Advanced Measurement of Intelligence   Prep. 21.323
Measurement of Intelligence and evidence
of competency with the Stanford-Binet Scale

Deals with the individual measurement of intelligence utilizing the Wechsler Scales. Major emphasis is on the administration, scoring, and interpretation of these scales, and a certificate will be issued to those students who complete the testing requirements under supervision. Consideration will be given to the intellectual evaluation of individuals presenting special problems and to the adjunct diagnostic features of the Wechsler Scales.   (Offered yearly, 2nd semester)

21.340   Research Methods in Education

The student will receive a practical introduction to the study of educational problems through the completion of an original research study. The student will formulate a problem, review related research studies, collect and analyze original data, and draw conclusions from the findings of his study. This individual experience in carrying out and writing up a research study is supplemented by classroom discussion of methods of data collection and research design. Emphasis is placed on the experimental approach to the solution of educational problems and problems of measurement, observation, and other statistical techniques are considered.   (Offered yearly, 1st and 2nd semester, and summer)

21.351   The Nature, Management, and Special Education of Exceptional Children

A two-semester survey course for educators and all others concerned with one or more aspects of exceptional children. It will involve a study of the nature, etiology, diagnosis, treatment, and special education of the various problems of these children. This half of the course deals with

physical handicap, visual impairment, organic disorders, brain injury, speech disorder, and hearing impairment. Lectures, discussions, clinical demonstrations, and films provide greater appreciation, understanding, and insight into the manifold problems of the exceptional child.

(Offered 1964-65, 1st semester)

21.352 The Nature, Management, and Special Education of Exceptional Children

This half of the course deals with intellectual deviates (both gifted and retarded), reading disabilities, behavior and emotional disorders, vocational problems, delinquency, and a consideration of the psychological aspects of visual impairment. (Offered 1964-65, 2nd semester)

21.357 Teaching the Slow Learner

A study of the types of slow-learning children—the mentally retarded, the educationally retarded, the emotionally handicapped children who are enrolled in the regular classrooms—with emphasis on the adaptation of the curriculum to effect an adequate adjustment for these children. Other aspects to be studied will be the diagnosis and classification of retarded children; the help from the home, the church, and other community resources; the extent of therapy in the school program; a study of the psychology of the retarded child in relation to a flexible curriculum for his growth and development. (Offered 1965-66, 1st semester)

21.371 Foundations of Guidance

A basic foundation in the fundamental concepts of guidance, the history and development of the guidance movement, the interdisciplinary aspects of guidance, and in the philosophy and goals of the guidance movement. The relevance of guidance to a number of major contemporary problems of both society and individuals will be examined. A major purpose of this course will be to increase the self understanding of the student, particularly with regard to the student's own philosophy of life, of education, and of work with individuals.

(Offered yearly, 1st and 2nd semester and summer)

21.372 Administration of Guidance Services   Prep. 21.371
Foundations of Guidance; 21.322 Tests and Test
Procedures; 21.374 Counseling I

This is an advanced level guidance course designed to help meet the certification requirements for guidance director in Massachusetts. The course will cover principles and methods of setting up and administering a guidance program in the public schools. Attention will be given to the various pupil personnel functionaries in the schools and their integration in a guidance program. Scheduling guidance activities, setting up testing programs, developing record systems, and hiring and supervising staff will be some of the topics discussed.

(Offered yearly, 2nd semester)

21.373   Occupational Information

A background course for teachers and counselors. The following areas of occupational information will be emphasized: occupational trends in relation to social and economic changes, classification and description of job opportunities, collecting and evaluating occupational information, and compilation and maintenance of files on occupational source materials.   (Offered summer, 1964)

21.374   Counseling I   Prep. 21.371 Foundations of Guidance
                                  and 21.322 Tests and Test
                        Procedures. With permission of instructor may be
                              taken concurrently with these two courses

This first part of a two semester requirement for students preparing for guidance positions in the schools will deal with basic theories, philosophies, and techniques of counseling. Emphasis will be on counseling related to educational, vocational, and personal adjustment problems encountered in the school setting. Some case materials will be presented for analysis and discussion.

(Offered yearly, 1st semester and summer)

21.375   Counseling II   Prep. 21.374 Counseling I

Advanced work in counseling for students following the guidance sequence and primarily intended as preparation for the practicum which follows. Some more advanced theoretical material will be considered, but primarily the course will be a laboratory experience dealing extensively with case studies, test interpretation, and interviewing practice through role playing. Students will be required to complete a case study.

(Offered yearly, 2nd semester)

21.376   Practicum in Guidance   Prep. 21.371 Foundations of
                               Guidance; 21.322 Tests and Test Procedures,
                           21.374 Counseling I; and 21.375 Counseling II. With the
                          permission of the Director of Counselor Education, 21.375
                                  may be taken concurrently with the practicum

The practicum represents supervised counseling experience in an actual guidance program. Placement for this experience may be in a public school, in the University Testing and Counseling Center, or in a private agency. Approximately 120 hours are required, distributed among a required seminar, counseling experience and "non-counseling" guidance work. In general, the supervision is done through tape recorded interviews and conferences with the supervisor.

(Offered yearly, 1st and 2nd semester and summer)

21.401   Social Foundations of Education I

Designed to increase understanding of human behavior and to develop objectivity and perspective in viewing society. Human personality will be viewed in its dynamic aspects and in relationship to group influences.

The American school will be analyzed as a social institution within the broader framework of a dynamic social system.

(Offered yearly, 1st semester)

21.402   Social Foundations of Education II   Prep. 21.401
Social Foundations of Education

Investigation of contemporary trends and issues and analysis of personal and social problems in American society. Emphasis will be placed upon critical analysis of American ideals and values and the role of the school in a democratic society.   (Offered yearly, 2nd semester)

21.475   History of Educational Thought I

This course will examine educational theory and practice from antiquity to the Reformation. An attempt will be made to apply sociological and philosophical viewpoints to systems of education, beginning with primitive societies and continuing through Oriental civilizations, the classical period of Greece and Rome, the early and medieval Christian eras, the Renaissance period and the Reformation.

(Offered yearly, 1st semester)

21.476   History of Educational Thought II

A continuation of 21.475. The course deals with the development of educational theory and practice from the time of the Reformation to the present. Among the topics considered are the transition from humanism to realism in education; rationalism and naturalism as these are reflected in education; the impact of psychology upon education; the growth of the curriculum; the ''new'' education.   (Offered yearly, 2nd semester)

Credit: 3 semester hours

21.501-21.502   Thesis—Seminar

Original study under the direction of the department.

*Graduate School
of
Engineering*

ENGINEERING PROGRAMS

The curricula of the degree programs are given under each departmental heading. The descriptions of courses offered by the several departments are given so that prospective students may obtain a view of the course coverage. Preparation courses are indicated in each instance. Not all courses are offered every year, but the course offerings will be arranged in such a manner that students may make continuous progress toward the degree.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level, and the University reserves the right to cancel any course for which an insufficient number of students apply.

All courses carry two semester hours of graduate credit unless specified otherwise.

The full-time day program in chemical, civil, electrical, and mechanical engineering operates on the Co-operative Plan by which a student, during each of two school years, has two ten-week terms of classes at Northeastern. During the first year this is supplemented by a ten-week and twenty-two week summer term of Co-operative work with his employer. The second year the student has two ten-week terms of Co-operative employment. Two students may form a Co-operative pair, alternating their classroom study with their employment periods, although arrangements for one student can easily be made. The University Department of Co-operative Education will arrange for the employment of the graduate students.

Applications for these programs should be filed as soon after January 15 as possible with all supporting data as required by the Graduate School. The curricula of these programs are given under the departmental headings.

Evening part-time programs are given in the departments of civil, electrical, mechanical engineering and engineering management. The curricula for each of these courses of study are given under the respective departments. All part-time students must register in the Graduate School and present a transcript of undergraduate record at that time. A circular describing the courses offered during the first semester and giving the registration and interview dates is issued in July. A similar circular for the second semester is issued in December, and for the summer one is issued in May.

ACADEMIC CALENDAR

EVENING PART-TIME PROGRAM
May 1964—June 1965
Summer Session 1964

Interview and Registration Period	Monday-Friday	May 18-May 29
Memorial Day, Office Closed	Saturday	May 30
Classes Begin	Monday	June 1
Independence Day, Office Closed	Saturday	July 4
Classes End	Tuesday	July 21
Examination Period	Wednesday-Thursday	July 22-July 23

First Semester 1964-1965

Registration Period for Former Students	Monday-Saturday	July 6-Sept. 12
Interview and Registration Period for New Students	Monday-Saturday	Aug. 17-Sept. 12
Labor Day, Office Closed	Monday	Sept. 7
Classes Begin	Monday	Sept. 14
Columbus Day, No Classes	Monday	Oct. 12
Veterans' Day, No Classes	Wednesday	Nov. 11
Thanksgiving Vacation	One Week	Nov. 23-Nov. 28
Classes Resume	Monday	Nov. 30
Christmas Vacation	Two Weeks	Dec. 21-Jan. 1
Classes Resume	Monday	Jan. 4
Classes End	Friday	Jan. 15
Examination Period	Monday-Friday	Jan. 18-Jan. 22
No Classes	Monday-Friday	Jan. 25-Jan. 29

Second Semester 1964-1965

Registration Period for Former Students	Monday-Saturday	Jan. 4-Jan. 30
Interview and Registration Period for New Students	Monday-Saturday	Jan. 11-Jan. 30
Classes Begin	Monday	Feb. 1
Washington's Birthday, No Classes	Monday	Feb. 22
Patriots' Day, No Classes	Monday	April 19
Classes End	Friday	May 14
No Classes	One Week	May 17-May 21
Examination Period	Monday-Friday	May 24-May 28

ACADEMIC CALENDAR

GRADUATE CO-OPERATIVE PROGRAM

July 1964—June 1965

Registration for both Division A and B First and Second Year Students	Monday-Friday	July 13-Sept. 11
Labor Day, Office Closed	Monday	Sept. 7
Classes Begin for Division A Students	Monday	Sept. 14
Columbus Day, No Classes	Monday	October 12
Veterans' Day, No Classes	Wednesday	Nov. 11
Final Examination Period for all Division A Students	Monday-Friday	Nov. 16-Nov. 20
Classes Begin for Division B Students	Monday	Nov. 23
Thanksgiving, No Classes	Thursday-Friday	Nov. 26-27
Classes End at 5 p.m. for Christmas Holiday	Tuesday	Dec. 22
Classes Resume after Holiday at 9 a.m.	Monday	Dec. 28
New Year's Day, No Classes	Friday	Jan. 1
Final Examination Period for All Division B Students	Monday-Friday	Jan. 25-Jan. 29
Registration for Division A and Division B Students	Monday-Friday	Jan. 4-Jan. 29
Second Term Classes Begin for Division A Students	Monday	Feb. 1
Classes End at 5 p.m. for Washington's Birthday Recess	Friday	Feb. 19
Classes Resume after Recess at 9 a.m.	Thursday	Feb. 25
Thesis Due for Second Year Division A Students	Monday	March 22
Final Examination Period for All Division A Students	Monday-Friday	Apr. 5-Apr. 9
Second Term Classes Begin for Division B Students	Monday	Apr. 12
Patriots' Day, No Classes	Monday	Apr. 19
Memorial Day	Monday	May 31
Thesis Due for Second Year Division B Students	Tuesday	June 1
Final Examination Period for All Division B Students	Monday-Friday	June 7-June 11
Commencement	Sunday	June 20

COMMITTEE ON GRADUATE STUDY
IN
ENGINEERING

George W. Hankinson, A.B., S.B., M.S., Chairman — Director of the Graduate School of Engineering and Professor of Civil Engineering

Alvah K. Borman, B.S. — Associate Professor of Co-operative Education

Laurence F. Cleveland, B.S., M.A., P.E. (Mass.) — Professor of Electrical Engineering

Arthur E. Fitzgerald, E.E., M.S., Sc.D. — Professor of Electrical Engineering and Chairman of the Department

Arthur R. Foster, B.S., M.Eng. — Professor of Mechanical Engineering and Chairman of the Department

James M. Moore, B.S., M.S. — Professor of Industrial Engineering and Chairman of the Department

Ronald E. Scott, B.A., M.A., Sc.D. — Dean of Engineering

Ernest L. Spencer, S.B., M.S. — Professor of Civil Engineering and Chairman of the Department

Richard E. Sprague, B.S., B.B.A., M.B.A., E.D.M. — Administration Assistant in Graduate Division

Harold L. Stubbs, A.B., M.A., Ph.D. — Professor of Mathematics and Chairman of the Department

Ralph A. Troupe, B.S., M.S., Ph.D. — Professor of Chemical Engineering and Chairman of the Department

Arthur A. Vernon, S.B., M.S., Ph.D. — Dean of the Graduate Division

William C. White, S.B., Ed.M., Eng.D. — Vice President and Provost of the University

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Lecturer in Engineering

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Associate Professor of Electrical Engineering and Director of Computation Center

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Sze Hou Chang
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Engineering

B. Alva Schoomer
Lecturer in Engineering

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Dean of Engineering and Professor
of Electrical Engineering

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Engineering

Henry Simon
Lecturer in Engineering

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and Chairman of the Department

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Lecturer in Engineering

Thomas C. Stockebrand
Lecturer in Electrical Engineering

Harold M. Stone
Lecturer in Engineering

Robert D. Stuart
Associate Professor of Research
in Communications

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and Chairman of the Department

Claude Valle, Jr.
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Alexander Vanderburgh, Jr.
Lecturer in Engineering

John H. Wells
Lecturer in Engineering

Robert G. Wertheimer
Lecturer in Engineering

Robert B. Wilcox
Lecturer in Engineering

Leslie E. Woods
Lecturer in Engineering
Management

John M. Woulbroun
Lecturer in Engineering

Alvin J. Yorra
Associate Professor of Mechanical
Engineering

Marvin L. Zeichner
Lecturer in Engineering

John Zotos
Assistant Professor of Mechanical
Engineering

Chemical Engineering

THE MASTER'S DEGREE

Admission

To be enrolled for graduate work in chemical engineering, applicants must have obtained a Bachelor of Science degree in Chemical Engineering from a recognized institution.

Full-Time Program on Co-operative Plan

The full-time program in chemical engineering operates on the Co-operative Plan as described on the page preceding the academic calendars. The thirty semester hours of work required for the degree will normally be distributed over four terms according to the following pattern.

FIRST YEAR

First Terms		Second Terms	
Required Courses	4	Required Courses	4
Elective Courses	4	Elective Courses	4

SECOND YEAR

Required Courses	4	Required Courses	4
Elective Courses	4	Elective Courses	2

Part of the required work is a thesis for six semester hours credit; the thesis must be started at the beginning of the second academic term. The program of each student will be made up from the required and elective courses available in each term and approved by the chairman of the department.

Required Courses			Electives		
4.711	Thermodynamics	2	4.103	Mathematics for Chemical Engineers	2
4.722	Chemical Eng. Kinetics	2	4.105	Advanced Chemical Engineering Calculations	2
4.811	Mass Transfer (Distil.)	2			
4.813	Mass Transfer (Diffus.)	2	4.111	Properties of Liquids and Gases	2
4.822	Transport Phenomena	2	4.302	Design—Chemical Processes	2
4.902	Thesis	2			
4.903	Thesis	2	4.406	Heat Transmission	2
4.904	Thesis	2	4.512	Fluid Mechanics	2

Six semester hours may be elected from any courses in engineering or science for which the student has the necessary preparation.

THE DOCTOR'S DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Chemical Engineering.

Admission

Applicants who are enrolled as candidates for the degree of Master of Science in Chemical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Chemical Engineering for admission to the doctoral program. Such application must be made by April first of the year in which they expect to receive the Master's degree. The departmental graduate committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the Master's degree should obtain an application for an interview form from the Graduate School Office. This form, together with transcripts of all undergraduate and graduate work must be transmitted to the chairman of the departmental graduate committee. The applicant will be notified of an interview time and, after the interview, will be advised if he should make formal application for admission to the doctoral program. Approved applicants must then submit an application for admission as a doctoral candidate and two letters of recommendation not later than May first. The applicant will then be notified of the acceptance of his application and the date of the qualifying examination.

Qualifying Examination

The qualifying examination includes a written and an oral part and is normally given in June and November. The written examination in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take any or all of the examinations in each set, and may repeat a failed examination, only once, at a later offering. Taking of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate School regulations.

Residence Requirement

After degree candidacy has been established, the residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the departmental graduate committee in order to give evidence that at least half of the time is being devoted to the requirements of the Graduate School program. In general, it should be expected that at least two years of full-time work after establishment of degree candidacy will be necessary.

Comprehensive Examination

The comprehensive examination is combined with the final oral examination.

Course Requirements

The course requirements in addition to the minimum requirement of thirty semester hours for each applicant will be determined by the departmental graduate committee and the student in consultation with the Committee. A minimum of 14 credits must be pursued beyond the minimum requirement. A typical program might consist of the following:

  4 credits electives either in Chemical Engineering or related fields
  4 credits mathematics
  4 credits devoted to the field of specialization
  2 credits seminar (1 credit per semester, 2 semesters required)

Although no fixed credits are assigned to the thesis effort, candidates will be required to devote time and effort on the thesis at least equal to that of the course work. Normally the thesis will require much more.

Transfer credit will be dealt with on an individual basis by departmental graduate committee.

Thesis

A thesis advisor is appointed by the departmental graduate committee and the topic is approved after consultation with the student, advisor, and graduate committee chairman. A proposal must then be submitted in writing to the thesis advisor who will obtain approval by the graduate committee chairman.

Foreign Language

The foreign language requirement may be satisfied by a reading knowledge in two languages selected from French, German and Russian. The examinations are administered by the department and consist of translation from current scientific journals or textbooks.

Final Oral Examination

This examination is held in accordance with the general Graduate Division regulations.

DESCRIPTION OF COURSES

All courses carry two semester hours of credits. Seminars and thesis may have varying credits established by the department at the time of registration. After each course title is indicated the term or semester in which it is given. "Semester" indicates that the course is given in the evening according to the semester calendar and "term" indicates that the course is given in the day according to the co-operative calendar.

4.103   Mathematics for Chemical Engineers   Prep. Differential
                equations and Bachelor of Science degree in Chemical Engineering
A consolidation of mathematical procedures most used by chemical engineers. Attention is given to the problems of expressing a physical situation in mathematical language.   (Offered 1963-64, 1st term)

4.105   Advanced Chemical Engineering Calculations   Prep. Bachelor
                        of Science degree in Chemical Engineering
The study of complex material and energy balances is undertaken with the view to apply these to actual plant conditions.
                        (Offered 1964-65, 1st term)

4.111   Properties of Liquids and Gases   Prep. Bachelor of Science
                        degree in Chemical Engineering or Chemistry
A presentation and critical analysis of methods of correlating and estimating the physical properties of gases and liquids.
                        (Offered 1964-65, 2nd term)

4.241   Corrosion Fundamentals   Prep. Bachelor of Science degree
Economic factors, basic theories, types, behaviors of specific systems and protection against corrosion are studied. Wherever possible, engineering applications of the principles studied are emphasized.
                        (Offered 1965-66, 1st semester)

4.302   Design-Chemical Processes   Prep. Bachelor of Science degree
                        in Chemical Engineering
The creative aspects of the design of chemical processes is studied. Actual case studies are made of creative designs.
                        (Offered 1964-65, 2nd term)

4.406   Heat Transmission   Prep. Heat transfer
Discussion of the three mechanisms of heat transmission. Presentation of Fourier's law governing heat transfer by conduction with applications in steady-state and transient processes. General problems involving heat

transfer by radiation. Natural and forced convection. Applicaton of these principles to the design of heat exchange equipment for carrying out heating of fluids, condensation, boiling, and so forth.

(Offered 1965-66, 2nd semester)

4.503   Chemical Data Estimation   Prep. Bachelor of Science degree
Methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigations. Latest empirical relationships and physical and thermodynamic laws are introduced to obtain data for plant design and other chemical and engineering uses.   (Offered 1965-66, 2nd semester)

4.512   Fluid Mechanics   Prep. Fluid mechanics
Development of the continuity momentum and energy relationships which govern the flow of real fluids. Applications to situations of laminar and turbulent flow in closed conduits. Presentation of the boundary layer concepts in laminar flow situations. Extension of these ideas to the turbulent case with discussion of the mixture length hypotheses and statistical theory.   (Offered 1965-66, 1st term)

4.711   Thermodynamics   Prep. Chemical engineering thermodynamics
A thermodynamic analysis of processes of interest to the chemical engineer. Thermodynamics is used as a tool and a method of approach to the solution of industrial problems. Fundamental principles are reviewed to the extent needed.   (Offered 1964-65, 1st term)

4.722   Chemical Engineering Kinetics   Prep. Thermodynamics,
chemical engineering kinetics or equivalent
A review of the principles of reaction kinetics. Problems for solution similar to those encountered in the design and operation of reaction equipment are selected to illustrate important principles.

(Offered 1965-66, 2nd term)

4.811   Mass Transfer (Distillation)   Prep. Unit operations or equivalent
Review of the physical chemistry background of distillation and rectification covering development of phase equilibria relationships and thermodynamic evaluation of experimental data. This is a more complete and advanced treatment of distillation than is possible in an undergraduate course.   (Offered 1964-65, 1st term)

4.813   Mass Transfer (Diffusion)   Prep. Unit operations or equivalent
Development of basic rate equations for mass transfer involved in the transfer of materials between phases. Absorption and extraction processes are studied.   (Offered 1965-66, 1st term)

4.822 Transport Phenomena   Prep. Unit operations or equivalent
A consideration of the relationships of mass, momentum, and energy
transfer. Fundamental equations of change covering the transport of
momentum, heat, and mass are developed to illustrate the essential
unity of the transport processes. Molecular, microscopic, and mascro-
scopic systems are studied. It will be seen that much of the theory
behind the engineering calculations on which the unit operations of
chemical engineering are based can be organized and integrated in terms
of equations of change.   (Offered 1964-65, 2nd term)

4.899 Special Topics in Chemical Engineering   Prep. Admission to
                          the doctoral program in Chemical Engineering
Topics of interest to the staff member conducting this class are pre-
sented for advanced study. A student may not take more than one
Special Topics course with any instructor.
                                (Offered yearly, 1st and 2nd terms)

4.902-4.904   Thesis
Analytical and/or experimental work conducted under the supervision
of the department. For master's degree requirement.   (Offered yearly)

4.905 Doctorate Thesis   Prep. Admission to the doctorate program in
                                                chemical engineering
Theoretical and experimental work conducted under the supervision of
the department.   (Offered yearly)

4.910 Seminar   Prep. Admission to the graduate program
                                            in chemical engineering
Topics of an advanced nature are presented by staff, outside speakers,
and students in the graduate program. This course must be attended by
all graduate students.   (Offered yearly)

Civil Engineering

THE MASTER'S DEGREE

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Civil Engineering, applicants must have obtained a Bachelor of Science degree in Civil Engineering from a recognized institution. Applicants with a bachelor's degree in other fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

Full-Time Program on Co-operative Plan

The full-time program in civil engineering operates on the Co-operative Plan as described on the page preceding the academic calendars. The thirty semester hours of work required for the degree will normally be distributed over four terms according to the following pattern.

FIRST YEAR

First Terms		Second Terms	
Required Courses	8	Required Courses	6
		Elective Courses	2

SECOND YEAR

Required Courses	6	Required Courses	2
Elective Courses	2	Elective Courses	4

A thesis for four semester hours credit is elective with the approval of the department. If the thesis option is approved, the work is done in the second year of the program. The program of each student will be made up from the required and elective courses available in each term and approved by the chairman of the department.

Required Courses

1.401	Indeterminate Structures	1.602	Design of Structures
1.402	Indeterminate Structures	1.604	Reinforced Concrete
1.403	Indeterminate Structures		Shell Structures
1.504	Soil Mechanics	1.605	Prestressed Concrete
1.505	Soil Mechanics	14.101	Advanced Mathematics
1.506	Soil Testing Laboratory		or
1.600	Adv. Structural Mechanics	14.230	Probability
1.601	Design of Structures	14.102	Advanced Mathematics

Electives

The electives may be taken from any courses in engineering or science for which the student has the necessary preparation.

Evening Part-Time Programs

The admission requirements for these programs are the same as for the full-time program, but students may progress according to their abilities and the time available.

Required Courses

Structures Major			Sanitary Major		
1.401	Indeterminate Structures	2	1.201	Sanitary Engineering . .	2
1.402	Indeterminate Structures	2	1.202	Sanitary Engineering . .	2
1.403	Indeterminate Structures	2	1.203	Sanitary Chemistry	2
1.504	Soil Mechanics	2	1.204	Sanitary Bacteriology . .	2
1.505	Soil Mechanics	2	1.205a	Sanitary Analysis	2
1.601	Design of Structures . . .	2	1.205b	Sanitary Analysis	2
1.602	Design of Structures . . .	2	1.206a	Sanitary Laboratory . . .	2
1.605	Prestressed Concrete . .	2	1.206b	Sanitary Laboratory . . .	2
		16			16

Electives

Fourteen semester hours must be elected from civil engineering courses or from any courses in engineering or science for which the student has the necessary preparation.

DESCRIPTION OF COURSES

All courses carry two semester hours of credits. Seminars and thesis may have varying credits established by the department at the time of registration. After each course title is indicated the term or semester in which it is given. "Semester" indicates that the course is given in the evening according to the semester calendar and "term" indicates that the course is given in the day according to the co-operative calendar.

1.201   Sanitary Engineering   Prep. Two semesters of
                                                             sanitary engineering

The theory and practice of water treatment and the basic design of water treatment works, including: slow sand filtration, sedimentation, coagulation, rapid sand filtration, softening, disinfection, corrosion control, iron removal, and fluoridation.   (Offered 1964-65, 1st semester)

1.202   Sanitary Engineering   Prep. Two semesters of
                                                             sanitary engineering

The theory and practice of sewage treatment and the basic design of sewage treatment works, including: requirements of receiving waters, screening, grit removal, sedimentation, Imhoff tanks, chemical treatment, trickling filters, sand filters, activated sludge process, treatment and disposal of sludge in digesters, drying beds and filters, and disinfection.
(Offered 1964-65, 2nd semester)

1.203   Sanitary Chemistry   Prep. Two semesters of general chemistry
An advanced course of general chemistry stressing the basic chemical laws as they apply to the field of sanitary engineering. The course includes the following: fundamental laws, stoichiometry, gas laws, atomic structure, periodic system, hydrogen, alkali metals, halogens, oxygen group, aluminum group, carbon, nitrogen group, iron and manganese, acidimetric normality, oxidation and reduction, and oxidation potential.
(Offered 1965-66, 1st semester)

1.204   Sanitary Bacteriology   Prep. 1.203 Sanitary Chemistry
A course of study in the field of bacteriology with emphasis on those phases of bacteriology employed by the sanitary engineer, namely, growth, form, environment, enzymes, disinfection, carbon cycle, nitrogen cycle, molds, yeasts, iron bacteria, sulphur bacteria, bacteriology of water and sewage, bacteriology of milk, swimming pools, and quantitative bacteriology.   (Offered 1965-66, 2nd semester)

1.205a   Sanitary Analysis   Prep. 1.203 Sanitary Chemistry
and 1.204 Sanitary Bacteriology
A laboratory course applying the principles of quantitative chemical analysis to the treatment of water and sewage. "Standard Methods" of analysis of water and sewage (chemical and bacteriological) are employed. The writing and interpretation of sanitary reports are stressed.
(Offered 1964-65, 1st semester)

1.205b   Sanitary Analysis   Prep. 1.205a Sanitary Analysis
A continuation of the laboratory course of 1.205a. Further analysis of water and sewage is pursued. The reporting and interpretation of sanitary reports are again stressed.   (Offered 1964-65, 2nd semester)

1.206a   Sanitary Laboratory   Prep. 1.205b Sanitary Analysis
A laboratory course studying water purification and the writing of reports on the following topics: aeration, coagulation, odor and taste removal, corrosion, and softening.   (Offered 1965-66, 1st semester)

1.206b   Sanitary Laboratory   Prep. 1.206a Sanitary Laboratory
A continuation of course 1.206a, but studying sewage treatment and written reports on the following topics: B. O. D., chemical precipitation, sludge filtration, chlorination, activated sludge, and sludge digestion.
(Offered 1965-66, 2nd semester)

1.208   Industrial Waste   Prep. 1.203 Sanitary Chemistry
and 1.204 Sanitary Bacteriology
A study of various manufacturing processes and their waste problems, together with methods of utilization, treatment, and disposal of their

waste products. Specific processes that can be adapted to specific waste and their necessary concomitant structures are studied with the viewpoint of designing suitable treatment plants.

(Offered 1964-65, 1st semester)

1.209 Stream Sanitation Prep. 1.203 Sanitary Chemistry and 1.204 Sanitary Bacteriology

The basic principles of stream sanitation and corrective control methods. The topics taken up in this course include the following: aerobic and anaerobic decomposition, oxygen balance, carbon dioxide, oxidation, reduction, bacterial pollution, industrial pollution, sewage pollution, water supply, shellfish, fish life, riparian rights, recreation, and general stream sanitation. (Offered 1964-65, 2nd semester)

1.211 Advanced Hydraulics Prep. Two semesters of hydraulics

An advanced course in hydraulics, presenting the following concepts: energy, continuity, momentum, flow nets, significance of the Froude and Reynolds numbers, fluid motion in a closed conduit, open channels, surface resistance, dimensional analysis, dynamic similarity, theory of models, and pipe networks. (Offered 1965-66, 1st semester)

1.212 Advanced Hydraulics Prep. 1.211 Advanced Hydraulics

A continuation of course 1.211, with further study of open channel flow, backwater curve, drawdown curve, hydraulic jump, location of hydraulic jump, transitions in channels, theory of waves, cavitation, and water hammer. (Offered 1965-66, 2nd semester)

1.213 Water Resources Planning I—Hydrology Prep. Differential and integral calculus

Study of meteorological principles. Review of hydrologic cycle. Statistical and other analyses of precipitation, surface runoff, ground water, evaporation, transpiration, and sedimentation. Applications to problems of design, construction and operation in hydraulic and sanitary engineering. These problems relate to drainage, municipal water supply, irrigation, flood control, hydroelectric power, and water pollution control.

(Offered 1964-65, 1st semester)

1.214 Water Resources Planning II—Hydrology Prep. 1.213 Water Resources Planning I

Application of statistics, mathematical models, and high-speed computers to hydrologic analyses and other areas of water resources planning. Review of legal aspects of water utilization and control. Study of problems of multi-purpose water-resource developments. Benefit-cost analyses and other financial analyses. Elements of reports covering technical and economic feasibility of projects. Study of regulatory agencies for water supplies and water pollution control.

(Offered 1964-65, 2nd semester)

1.215   Public Health Engineering I   Prep. 1.201 and 1.202
                                                            Sanitary Engineering
A comprehensive study of the application of engineering principles to disposal of garbage and other refuse; control of insect-borne diseases; milk and food sanitation; camp, swimming pool and other recreational sanitation; rodent control. Public health aspects of housing are also treated such as those related to plumbing; heating, ventilating, and air conditioning; lighting; noise control.   (Offered 1965-66, 1st semester)

1.216   Public Health Engineering II   Prep. 1.215
                                                        Public Health Engineering I
This course is a continuation of Public Health Engineering I and covers the control of atmospheric pollution; industrial health and safety; radiological health and safety. A review is made of the applications of biostatistics. The administration of public health engineering functions in municipal, state, and federal departments is also analyzed.
                                                        (Offered 1965-66, 2nd semester)

1.217   Air Pollution   Prep. 1.215 and 1.216
                                                          Public Health Engineering
Theory and practice related to engineering management of air resources, control of gaseous emission, investigation and study of air pollution, sampling and analysis methods.   (Offered 1964-65, 1st semester)

1.218   Radiological Health Engineering   Prep. 1.215 and 1.216
                                                          Public Health Engineering
Types and sources of radioactive wastes, methods of handling, storage, and disposition of solid, liquid and gaseous radioactive wastes. Regulatory agency requirements.   (Offered 1964-65, 2nd semester)

1.219   Sanitary Microbiology   Prep. 1.205b, Sanitary Analysis
Microorganisms commonly found in water, soil, milk and food. Special emphasis upon fresh water algae. Practical applications of treatment of water and waste water.   (Offered 1965-66, 1st semester)

1.401   Indeterminate Structures   Prep. Differential and integral
                                              calculus and theory of structures
Analysis of structures starting with a review of elementary theory, indeterminateness, stability, deflections, and proceeding to the analysis of indeterminate beams and trusses with strain energy (Castigliano), moment area, and theorem of three moments.
                                              (Offered yearly, 1st semester, 1st term)

1.402   Indeterminate Structures   Prep. 1.401 Indeterminate Structures
Continuation of course 1.401. Analysis of indeterminate frames, arches, and trusses by virtual work, slope deflection, and moment distribution. Effect of variable stiffness considered. Column analogy.
                                              (Offered yearly, 2nd semester, 2nd term)

1.403   Indeterminate Structures   Prep. 1.402 Indeterminate Structures
Continuation of course 1.402. Shear and moment distribution in the analysis of broken-story frame building for horizontal and vertical loads. Influence lines for indeterminate frames and trusses. Cables and suspension systems. Circular domes. Planar structure analyzed for loads perpendicular to its plane. Space frameworks. Introduction to Relaxation Methods.   (Offered yearly, 1st semester, 1st term)

1.404   Indeterminate Structures   Prep. 1.403 Indeterminate Structures
Included in this course are the following: Southwell's Relaxation Method, its application to pin-jointed frameworks and to rigid-jointed frameworks; secondary stresses in trusses, by classical methods and by iterative methods; analysis of towers and cables for electrical transmission lines, catenaries on inclined spans, and bimetallic cables.
(Offered 1964-65, 2nd semester)

1.501   Portland Cement and Asphalt Concrete   Prep. Materials of engineering
The following topics are considered: manufacture, physical and chemical properties of the various types of Portland cement, chemical and physical properties of aggregates, control of concrete materials, concrete mix design methods, factors affecting the properties of plastic concrete and concrete mix control. Two laboratory periods will be held during this semester.   (Offered 1965-66, 1st semester)

1.502   Cement and Concrete Technology   Prep. 1.501 Cement and Concrete Technology
A continuation of course 1.501, studying the following: physical properties and durability of hardened concrete, effect of aggregate characteristics on properties of concrete, including alkali-aggregate reactions, considerations of admixtures used in concrete manufacture such as air-entrainment, wetting, dispersion, pozzolanic materials, and use of light-weight aggregates. Theory and Principles of Asphalt Mixtures, Aggregate Blending Procedures, Mixture Design and Field Control Procedures. Laboratory periods will be held during this semester.
(Offered 1965-66, 2nd semester)

1.504   Soil Mechanics and Foundation Engineering
Prep. Differential and integral calculus, soil mechanics
Review of phase relationships, seepage, and ground water flow. Theory of consolidation, stress distribution, settlement analysis, stability of slopes and embankments.   (Offered yearly, 1st semester, 1st term)

1.505   Soil Mechanics and Foundation Engineering   Prep. 1.504
Soil Mechanics and Foundation Engineering
Lateral pressures; retaining wall and bulkhead design; bearing capacity of footings, piers, pile foundations; practical applications; uncertainties in design assumptions.   (Offered yearly, 2nd semester, 2nd term)

1.506   Soil Testing Laboratory Prep. 1.504 Soil Mechanics and Foundation Engineering

A laboratory course covering classification tests (Atterberg limits, specific gravity, and grain size analysis), compaction, permeability, consolidation, strength characteristics (unconfined compression, triaxial compression, and California Bearing Ratio) and field control tests.

(Offered yearly, 2nd semester, 1st term)

1.600   Advanced Structural Mechanics Prep. Differential and Integral Calculus and Theory of Structures

Introduction to the theories of elasticity, plasticity, plates and shells, buckling and response to dynamic loads.

(Offered 1964-65, 1st semester, 2nd term)

1.601   Design of Structures Prep. 1.402 Indeterminate Structures

An advanced course in structural design of steel and concrete including: critical inspection of building frames with emphasis on economics and selection of type, loft buildings, tall buildings, mill buildings, wind forces, and riveted and welded wind bracing connections.

(Offered yearly, 1st semester, 1st term)

1.602   Design of Structures Prep. 1.601 Design of Structures

A continuation of course 1.601, including the following topics: columns, columns in bending, requirements for lateral support, prestressing in steel and concrete, design of structures for dynamic loads, stress design vs. limit design, and timber design.

(Offered yearly, 2nd semester, 2nd term)

1.603   Structural Design for Dynamic Loading Prep. 1.601 Design of Structures (may be taken simultaneously)

Discussion of the behavior of materials, the response of structural systems, and the analysis and design of these systems involving dynamic loading. Vibration of bridges and blast-and-earthquake-resistant design are among subjects discussed.

(Offered 1964-65, 1st semester, 1st term)

1.604   Reinforced Concrete Shell Structures Prep. 1.605 Prestressed Concrete

Application of theory of plates and shells to analysis and design of folded plate roofs, cylindrical and spherical shells, domes, and hyperbolic paraboloids. (Offered 1964-65, 2nd semester, 2nd term)

1.605   Prestressed Concrete Prep. Reinforced concrete design

The following topics are considered: basic design concepts, properties of materials used for prestressing, review of research in prestressed concrete, construction practice covering various methods of both pre-tensioning and post-tensioning used to date, discussion of tests, and economics of prestressed concrete.

(Offered yearly, 1st semester, 1st term)

1.702   Computer Application for Civil Engineering   Prep. Admission
to graduate civil engineering program

An introduction to the principles and techniques of application of electronic digital computers to the solution of Civil Engineering problems. Classification of problems and discussion of the available methods of analysis. Logic and philosophy of programming problems inherent in analysis, design and experimental research. Students will develop finished programs for the IBM 1620 in FORTRAN language.

(Offered yearly, 2nd semester, 2nd term)

1.901-1.902   Thesis

Analytical and/or experimental work conducted under the auspices of the department.   (Offered yearly, 1st and 2nd terms)

Electrical Engineering

THE MASTER'S DEGREE

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Electrical Engineering, applicants must have obtained a Bachelor of Science degree in Electrical Engineering from a recognized institution. Applicants with a bachelor's degree in other fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

Full-Time Program on Co-operative Plan

The full-time program in electrical engineering operates on the Co-operative Plan described on the page preceding the academic calendar. The thirty semester hours of work required for the degree will normally be distributed over four terms according to the following pattern.

FIRST YEAR

First Terms			Second Terms		
Required Courses			**Required Courses**		
14.102	Advanced Mathematics	2	3.402	Transients in Linear Systems	2
3.401	Transients in Linear Systems	2	3.950	Seminar	2
3.949	Seminar	2	3.901	Electric Circuit Theory I	2
Elective		2	Elective		2
		8			8

SECOND YEAR

Required Courses			**Required Courses**		
3.902	Electric Circuit Theory II	2	3.090	Advanced Physics for Engineers	2
14.230	Probability	2	Electives (2)		4
Electives (2)		4			6
		8			

A student may elect additional work to the extent of four semester hours if he so desires. A limited amount of work may be elected from the evening part-time program.

A thesis for four semester hours credit is elective with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second year of the program. The program of each student will be made up from the required and elective courses available in each term and approved by the student's academic advisor.

Elective courses will normally be available according to the following schedule:

FIRST YEAR STUDENTS

First Term		Second Term	
3.229	Electronic Analog Computer Techniques	3.230	Computing and Control Devices
3.605	Transistor Circuit Engineering	3.606	Transistor Circuit Engineering
3.620	Semiconductor Electronics I	3.621	Semiconductor Electronics II
3.210	Space Electronics Systems I	3.211	Space Electronic Systems II
3.301	Theory of Microwaves	3.302	Theory of Microwaves
3.101	Servomechanisms	3.102	Advanced Servomechanisms

SECOND YEAR STUDENTS

First Term		Second Term	
3.501	Communication Theory	3.502	Communication Theory
3.231	Switching Circuits	3.232	Switching Circuits
3.210	Space Electronic Systems	3.211	Space Electronic Systems
3.301	Theory of Microwaves	3.302	Theory of Microwaves
3.101	Servomechanisms	3.102	Advanced Servomechanisms

Courses offered by other departments may be elected if scheduling is feasible with the approval of the students academic advisor.

Evening Part-Time Programs

The admission requirements for the part-time program leading to the degree of Master of Science in Electrical Engineering are the same as for the full-time program, but students may progress according to their abilities and the time available. Students who have not had the equivalent of 14.101 Advanced Mathematics must register for this course during their first year in the program.

MASTER OF SCIENCE IN ELECTRICAL ENGINEERING

Required Courses

Electronics-Communication Major			Power-Control Major		
3.401, 3.402	Transients in Linear Systems ...	4	3.401, 3.402	Transients in Linear Systems ...	4
or			or		
3.501, 3.502	Communication Theory .	4	3.001, 3.002	Systems ...	4
or			3.101, 3.102	Servomechanisms	4
3.501, 3.503	Communication Theory .	4	or		
3.901, 3.902	Electric Circuit Theory .	4	3.611, 3.612	Advanced Electrical Machinery ..	4
14.102	Advanced Mathematics	2	14.102	Advanced Mathematics	2
15.101	Classical Mechanics I	2	14.230	Probability	2
		12	or		
			15.101	Classical Mechanics I	2
					12

Electives

Ten semester hours must be elected from electrical engineering courses. Eight semester hours may be elected from graduate courses in engineering (including Engineering Management) or science for which the student has the necessary preparation.

THE DOCTOR'S DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Electrical Engineering.

Admission

Students who have completed thirty semester hours of graduate work with a satisfactory record should apply for an interview with a departmental staff member designated by the Electrical Engineering Departmental Graduate Committee. The application form for this appointment may be obtained from the Graduate Division office. This application, together with transcripts of all prior work and two letters of recommendation, should be forwarded to the Electrical Engineering Doctoral Committee no later than March 1st. After examination of this material an applicant will be

notified of the time of this appointment for an interview. Based upon the interview, successful applicants must file a formal application for admission to the doctoral program. The applicant will then be notified concerning the time at which the qualifying examination must be taken.

Qualifying Examination

The qualifying examination is composed of a written and an oral part. The written part covers the following material: electric circuits and servomechanisms, distributed circuits and electromagnetic fields, physics, and mathematics. The oral examination is designed to test general comprehension. These examinations are normally taken after successful completion of thirty semester hours of graduate work and are held on Tuesday, Wednesday, and Thursday immediately following Labor Day. If any part of the examination is failed, the entire examination may be repeated with permission of the department.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

Residence Requirements

After degree candidacy has been established, the residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the student's advisor in order to give evidence that at least half of the time is being devoted to the requirements of the Graduate Division program.

Comprehensive Examination

The comprehensive examination is combined with the final oral examination and is given after the thesis has been completed and approved. This examination is based upon subject matter and a defense of the thesis.

Course Requirements

The course requirements, in addition to the minimum requirement of thirty semester hours, are established by the departmental graduate committee for each candidate.

Thesis

In some cases, arrangements for a thesis advisor may have been established before the completion of the qualifying examinations. In any case, such arrangements must be made as soon as possible after degree candidacy has been established. Depending upon the nature of a project, a thesis committee may be appointed by the chairman of the department. This committee will be kept informed of the progress of the thesis and will approve the thesis in its final form.

Foreign Language

The foreign language requirement may be satisfied in French, German, or Russian. This examination will be administered by the departmental graduate committee and will consist of the translation of passages selected from current scientific journals or textbooks.

Final Oral Examination

This examination will be held in accordance with the general Graduate Division regulations.

DESCRIPTION OF COURSES

All courses carry two semester hours of credits. Seminars and thesis may have varying credits established by the department at the time of registration. After each course title is indicated the term or semester in which it is given. "Semester" indicates that the course is given in the evening according to the semester calendar and "term" indicates that the course is given in the day according to the co-operative calendar.

3.001   Systems Analysis   Prep. Bachelor of Science
                                                                         degree in engineering
Introduction to quantitative methods of complex systems analysis. Deterministic and stochastic approach. Markov processes, queuing theory, game theory, probabilistic networks, adaptive control, simulation, as tools of complex-system analysis. Examples of contemporary research problems.   (Offered yearly, 1st semester)

3.002   Systems Optimization Methods and Applications   Prep. 14.101
                                                                         Advanced Mathematics
Various methods of optimization will be studied, with emphasis on dynamic programming, Pontryagin's maximum principle and steepest descent methods. Applications to deterministic control, stochastic control, and adaptive control processes, and examples from the fields of electrical, mechanical and aerospace technology will be considered.
                                                               (Offered yearly, 2nd semester)

3.090   Advanced Physics for Engineers   Prep. 14.102
                                                                         Advanced Mathematics or equivalent
The object of this course is to give the student training in various fields of mathematical physics, both classical and down to and including quantum and relativistic concepts. As examples may be mentioned: dynamics of particles and rigid bodies; advanced dynamics; thermodynamics; theory of spectra; and an introduction to special relativity.
                                                               (Offered yearly, 2nd term)

3.101 Servomechanisms Theory

Prep. Transient analysis using Laplace transforms

A comprehensive treatment of methods of analysis and basic design of linear feedback control systems. The Laplace Transform is the basic technique for system representation. The Root Locus, Nyquist, and Bode-Nichols techniques are studied, and their use for complementary time and frequency domain analysis and design described. Standard feed-forward and feedback compensation schemes are studied and evaluated. A laboratory demonstration is included.

(Offered yearly, 1st semester, 1st term)

3.102 Advanced Servomechanisms

Prep. 3.101 Servomechanisms Theory

The study and application of advanced analysis and design techniques to feedback control systems with multiple-loops and multiple-inputs, including load disturbances. Additional investigations of the dynamic characteristics of electrical, mechanical, and hydraulic components, and the methods of compensating network design. The methods of design for nonlinear systems and sampled-data systems are studied.

(Offered yearly, 2nd semester, 2nd term)

3.103 Advanced Feedback Control Systems

Prep. 3.102 Advanced Servomechanisms

The design studies of feedback control systems by means of pole-zero configuration if the complex plane including multiple compensation, system performance in presence of constraints, and error analysis. Statistical design techniques and application, the analysis of sampled-data systems through z-transform theory. Nonlinear and discontinuance control systems using describing functions and phase-plane techniques, and adaptive-control system design are included in the subject matter.

(Offered 1964-65, 1st semester)

3.104 Sampled-Data and Adaptive Control Systems

Prep. 3.102 Advanced Servomechanisms

The treatment of important recent developments in control system theory. Sampled-data systems analyzed in terms of difference equations and the z-transform. Stability and compensation of digitally controlled systems. Critical discussion of adaptive control systems and their applications. Brief introduction to optimal control theory and the state space formulation.

(Offered yearly, 2nd semester)

3.201 Pulse and Digital Circuits

Prep. Transient analysis using Laplace transforms, electronic circuits

A treatment of the principles and techniques of pulse-forming and pulse-processing circuits basic to radar, television, digital computation, pulse-modulation systems, and data-processing systems. A review of wave-shaping circuits and transistor-circuit fundamentals, followed by a

study of wide-band linear amplifiers of pulse signals. Piecewise-linear techniques and graphical methods of analysis as applied to such non-linear circuits as clippers, clampers, binaries, multivibrators, and sweep generators. The devices considered are instrumented with tubes, semi-conductor devices such as transistors and diodes, magnetic-circuit elements, super-conductive elements. etc.   (Offered yearly, 1st semester)

3.202   Pulse and Digital Circuits   Prep. 3.201 Pulse and Digital Circuits
Extension of the methods of 3.201 to the analysis and design of pulse transformers, blocking oscillators, d-c to d-c converters, delay lines, distributed-line amplifiers, counting circuits, logical circuits, gates and voltage comparators. Typical pulse and digital systems are discussed with some consideration given to receiver noise figure and methods of improving the signal-to-noise ratio.   (Offered yearly, 2nd semester)

3.204   Digital Computer Coding and Logic   Prep. A bachelor's degree in engineering or science
A survey of the basic logic and techniques involved in the design and use of digital computers. Topics discussed will include the following: functions of a computer, logical design, basic components, principles of coding, input and output systems.

Considerable time will be spent on the translation of arithmetical and logical operations into digital computer instructions. Examples will be taken from typical business, engineering, scientific, and real-time control problems. It is expected the course will include at least one visit to a large scale computer in the Boston area.

(Offered yearly, 1st and 2nd semesters)

3.205   Computing and Control Devices   Prep. Advanced electronic circuits, including coverage of basic pulse circuits
Review of pulse circuit fundamentals. Engineering organization of computers. Boolean algebra; electronic switching circuits, electromechanical components, basic magnetic circuits; reliability techniques; acoustic, electrostatic and magnetic storage techniques; digital control units; transducers, operational-digital techniques; current and future developments.   (Offered yearly, 2nd semester)

3.210   Space Electronics Systems   Prep. A bachelor's degree in electrical engineering or physics
This course is primarily concerned with aerospace communications. Antenna gain, space loss, cosmic and atmospheric noise, polarization loss and receiver noise temperature will be discussed as factors influencing the system signal-to-noise ratio. Contemporary signal processing and modulation systems will be analyzed in some detail in order to arrive at comparative performance figures. Time and frequency division multi-

plexing will include treatment of sampling, aliasing errors, smoothing filters and cross-talk. Specific radio telemetry systems discussed will include FM/FM, PAM/FM/FM, PDM/FM, and PCM/FM.

(Offered yearly, 1st term)

3.211 Space Electronic Systems

Prep. 3210
Space Electronic Systems

Continuation of 3.210 to include communication systems for deep space probes, data processing techniques, sensors and typical instrumentation systems. Instrumentation associated with certain aspect systems, beacon tracking and radar control will be included.

(Offered yearly, 2nd term)

3.212 Physics of the Ionosphere

Prep. Electromagnetic
Theory (3.301 or equivalent)

This course will deal with the ionized regions of the earth's atmosphere from 50 to 400 km. Propagation of radio waves in ionized media. Elementary magneto-ionic theory. The use of radio waves as exploring tools—reflection from model ionosphere. Formation of layers in the earth's atmosphere. Survey of the properties of D, E and F regions as determined by radio methods. Direct methods of measurement, electrostatic probes. The use of rocket and satellite borne probes. Theories of the ionosphere—attempts to explain the formation of the layers in terms of the processes occurring in the upper atmosphere.

(Offered yearly, 2nd semester)

3.221 Radar Engineering

Prep. 3.501
Communication Theory or equivalent

Emphasis on the systems aspects of radar engineering. Topics covered include antennas; low-noise receivers; high-power transmitters; range, angle, and Doppler tracking systems; search radar systems. Mathematical descriptions are used throughout.   (Offered yearly, 1st semester)

3.222 Radar Engineering

Prep. 3.221 Radar Engineering

Continuation of 3.221, a further consideration of systems aspects. This course covers the principles of radar detection theory; matched filter and correlation receiver design; radar ambiguity function; radar uncertainty principles; radar waveform synthesis; fundamental accuracy limits; generalized tracking principles.   (Offered yearly, 2nd semester)

3.229 Electronic Analog Computer Techniques

Prep. A Bachelor of
Science degree which included coverage of electronic circuits

A review of fundamental circuit-theory principles as they will be used in developing analog models and an introduction to the understanding and utilization of the analog computer. The elements of analog computers are discussed, including summers, integrators, multipliers, and function

generators. Illustrative examples are given, and the scale factor problem is discussed in detail. Applications of analog techniques to practical problems will be discussed. (Offered yearly, 1st term)

3.230 Computing and Control Devices Prep. A Bachelor of Science degree which includes coverage of electronic circuits
Review of pulse circuit fundamentals. A survey of the basic logic and techniques involved in the design and use of digital computers. Introduction to Boolean Algebra. Electronic switching circuits; electromechanical components; basic magnetic circuits; electrostatic and magnetic storage techniques; digital control units; transducers; operational-digital techniques; current and future developments.

(Offered yearly, 2nd term)

3.231 Switching Circuits Prep. A bachelor's degree in engineering or science
Basic relay networks will be treated by the methods of switching algebra. Combinational, sequential and counting circuits will be given as well as the theory of error detecting and translating circuits.

(Offered yearly, 1st semester, 1st term)

3.232 Switching Circuits Prep. 3.231 Switching Circuits
Application of the material covered in 3.231. This includes work with iterative networks, sequential circuits, and special coding techniques.
(Offered yearly, 2nd semester, 2nd term)

3.301 Theory of Microwaves Prep. Advanced calculus, vector analysis and calculus of vectors
Derivation of the time-harmonic complex field equations and their application to waves, waveguides and radiation. Quality, uniqueness, equivalence and reciprocity theorems. Plane wave functions, mode sets, probes and apertures in waveguides.

(Offered yearly, 1st semester, 1st term)

3.302 Theory of Microwaves Prep. 3.301 Theory of Microwaves
Propagation in anisotropic media. The magneto-plasma considered from the macroscopic and microscopic viewpoint. Interaction between circuits, beams and waves. Coupled-mode theory. Travelling wave, backward-wave and parametric devices. (Offered yearly, 2nd semester, 2nd term)

3.303 Antenna Theory Prep. 3.301 Theory of Microwaves and 14.101 Advanced Mathematics
The transmitting and receiving properties of linear antennas and linear arrays, loop antennas, scalar diffraction theory, aperture and reflector antennas, space probes, application to problems in radio astronomy. (Offered yearly, 2nd semester)

3.311   High-Voltage Engineering   Prep. A-C theory
Insulation of the solid and liquid types. Lightning, surge protection in general, and insulation coordination. Corona. Destructive and non-destructive testing methods.   (Offered 1965-66, 2nd semester)

3.401   Transients in Linear Systems   Prep. Transient analysis
                                                    using Laplace transforms
Application of electric analogs to the solution of representative engineering systems including those involving electrical, mechanical, hydraulic, and thermal components. Complex-variable theory as it relates to the evaluation of the inversion integral. Comprehensive treatment of Fourier analysis.   (Offered yearly, 1st and 2nd semesters, 1st term)

3.402   Transients in Linear Systems   Prep. 3.401 Transients in
                                                            Linear Systems
A continuation of 3.401 to include an extensive treatment covering the applications of Fourier and Laplace transforms to complex systems. Determination of stability criteria and of the behavior of distributed-parameter systems. Solution of linear difference equations by the Z transform method and their application.
                            (Offered yearly, 1st and 2nd semesters, 2nd term)

3.411   Power System Stability   Prep. Polyphase A-C circuits,
                                                            A-C machinery
Includes a study of steady-state power limits and transient stability of electric power systems.   (Offered 1964-65, 1st semester)

3.412   Protective Relaying, as Applied to Power Systems
                        Prep. Polyphase A-C circuits, A-C machinery
Types of relays, calculation of short-circuit currents, the selection of the proper relay, and the solution of practical relaying problems.
                                            (Offered 1964-65, 2nd semester)

3.501   Communication Theory—Introduction   Prep. 14.102 Advanced
                        Mathematics or 3.402 Transients in Linear Systems or
                                        3.902 Electric Circuit Theory
First of five courses on communication theory to present an engineering analysis of statistical communication problems. This course is designed to provide the basic tools for the study of information theory and detection theory which are the subject matters of the four following courses. Particular subjects include signal theory, Fourier analysis, power spectrum and correlation function, sampling theorem, spectrum and noise in amplitude, angular and pulse modulation, an introduction to probability theory.   (Offered yearly, 1st and 2nd semesters, 1st term)

3.502   Communication Theory—Information Theory   Prep. 3.501
Communication Theory—Introduction

Second course on communication theory to present an engineering analysis of statistical communication problems. This course can be taken in addition to 3.503 although it is treated independently of that course. The course deals principally with three aspects of information theory: the statistical measure of information, the determination of channel capacity, and the fundamental coding theorems.

(Offered yearly, 1st semester, 2nd term)

3.503   Communication Theory—Detection Theory   Prep. 3.501
Communication Theory—Introduction

Third course on communication theory provides an engineering analysis of statistical communication problems. This course may be taken in addition to 3.502 although it is treated independently of that course. The course deals with the theories of detection and filtering of signals in the presence of noise. Particular subjects include description of random processes, detection process as testing of hypothesis, correlation detection, matched filtering, optimum linear filtering and prediction.

(Offered yearly, 2nd semester)

**3.504   Special Topics in Communication Theory—Advanced
Detection Theory**   Prep. 3.503
Communication Theory—Detection Theory

The decision theoretic aspects of detection and extraction of signals in the presence of noise. Particular subjects include the design of optimum detectors, sequential detection, estimation of signal parameters, and signal resolution. Selected topics are covered in seminars, prepared by Ph.D. candidates, in which the students participate in reading and discussing current technical literature on the subject.

(Offered yearly, 1 semester)

3.505   Special Topics in Communication Theory—Coding Theory
Prep. 3.502 Communication Theory—Information Theory

The theory of coding and decoding for reliable communication. Particular subjects include the derivation of theoretical bounds of errors in coding, methods of constructing algebraic and probabilistic codes, decoding techniques, and the use of coding on physical channels. Selected topics are covered in seminars, prepared by Ph.D. candidates, in which the students participate in reading and discussing current technical literature on the subject.   (Offered yearly, 2nd semester)

3.511   Acoustical Theory I   Prep. 14.101 Advanced Mathematics
Plane waves in air, waves in three dimensions, vibrating sources, mechanical radiation, acoustic impedance, propagation, psycho-acoustics.

(Offered yearly, 1st semester)

3.512   Acoustical Theory II   Prep. 3.511 Acoustical Theory I
Electromechanical systems, sound measurements, experimental acoustics, reproduction of sound, room acoustics, noise control, ultrasonics.
(Offered yearly, 2nd semester)

3.605   Transistor Circuit Engineering   Prep. Basic electronics
and electric circuits
Nonmathematical introduction to transistor physics. Equivalent circuits and mathematical analysis of basic amplifier configurations. D-C bias circuits. Noise.   (Offered yearly, 1st semester, 1st term)

3.606   Transistor Circuit Engineering   Prep. 3.605 Transistor
Circuit Engineering
Design of audio and power amplifiers. High-frequency operation, radio-frequency amplifiers, and oscillators. Switching circuits.
(Offered yearly, 2nd semester, 2nd term)

3.607   Lasers I   Prep. Bachelor of Science degree in
electrical engineering or physics
Device design theory, fabrication and technology, and applications of lasers will be presented in detail. (A course in or familiarity with introductory quantum mechanics or semiconductor physics is desirable but not essential.)   (Offered yearly, 1st semester)

3.608   Lasers II and Other Advanced Electron Devices   Prep. 3.607
Lasers I or equivalent
Further material on the design theory, fabrication and applications of lasers will be presented with special emphasis on the more complex problems and the underlying mathematical analysis. In addition, the design theory, fabrication and application of some other advanced electron devices will be briefly reviewed including: energy conversion devices, display devices, microelectronics devices, and solid state microwave devices.   (Offered yearly, 2nd semester)

3.611   Advanced Electrical Machinery   Prep. Bachelor's degree in
electrical engineering
Analytical development of the principles of operation of rotating electrical machinery. Special topics in the operation of D-C machines and A-C induction machines.   (Offered yearly, 1st semester)

3.612   Advanced Electrical Machinery   Prep. 3.611 Advanced
Electrical Machinery
Special topics in the operation of transformers, A-C asynchronous machines, and fractional-horsepower machines. Transient operation of electrical machines. Theory of dynamic operation of electrical machines in servomechanisms and control systems.
(Offered yearly, 2nd semester)

3.620 Semiconductor Electronics I   Prep. Bachelor's degree in
                                              Electrical Engineering or Physics
The fundamental concepts and theory underlying the present day semi-
conductor devices will be presented for the electronics engineer. Sub-
jects covered include: valence band and energy band models of a semi-
conductor, equilibrium distributions, carrier transport phenomena, the
diode equation, transistor parameters, etc.

(Offered yearly, 1st semester, 1st term)

3.621 Semiconductor Electronics II   Prep. 3.620 Semiconductor
                                                      Electronics I
The fundamental concepts of semiconductor electronics will be further
developed including application to tunnel diodes and varactors.

(Offered yearly, 2nd semester, 2nd term)

3.701 Electronic Engineering   Prep. Basic electronics and circuits,
                              Laplace transforms, 3.902 Electric Circuit Theory
Laplace transform theory and passive circuit theory are extended to
cover the design of vacuum-tube and transistor amplifiers which must
meet exacting requirements of some specified type. Stagger-tuned am-
plifiers with maximum gainbandwidth product are discussed. Stability
considerations are emphasized. Signal-flow graphs, Nyquist diagrams,
log-db plots, and root locus methods are considered.

(Offered yearly, 1st semester)

3.702 Electronic Engineering   Prep. 3.701 Electronic Engineering
The methods discussed in 3.701 are illustrated by examples from
selective R-C amplifiers, pulse amplifiers, computer amplifiers, and d-c
amplifiers. Design of amplifiers with crystal and mechanical filters and
amplifiers with minimum noise and maximum sensitivity.

(Offered yearly, 2nd semester)

3.801 Application of Microwaves   Prep. 3.302 Theory of Microwaves
Review of microwave circuit theorems; scattering matrices and applica-
tions; Eigenvalue problem; symmetrical three-port junctions; miscella-
neous junctions; four-port junctions; applications of 3-db couplers;
travelling-wave resonators; phase shifters and attenuators; non-recip-
rocal and ferrite devices and selected microwave system considerations.

(Offered yearly, 1st semester)

3.802 Application of Microwaves   Prep. 3.801 Application of Microwaves
One-port resonant cavity; transmission cavity; cavities in cascade; wave-
guide cavities; periodically loaded lines; microwave antennas; ferrites
and noise considerations.   (Offered yearly, 2nd semester)

3.803   Electromagnetic Wave Propagation   Prep. 14.102 Advanced
                                                    Mathematics or equivalent
Topics in wave propagation of prime importance in communications,
including basic magnetic-ionic theory, and the propagation of waves
in a spatially varying medium. The function and structure of the
ionospheric layers. Theory of refraction and absorption in the troposphere
and ionosphere.   ·   (Offered 1964-65, 1st semester)

3.804   Electromagnetic Wave Propagation   Prep. 3.803 Electromagnetic
                                                        Wave Propagation
Effects or irregularities in the troposphere and ionosphere. Tropospheric
and ionospheric scatter communications. Ionospheric scatter. Other
ionospheric irregularities such as meteor trails, aurora, ionospheric
storms, etc.   (Offered 1964-65, 2nd semester)

3.901   Electric Circuit Theory I   Prep. A-C circuit theory,
                                                    differential equations
General network analysis using matrix algebra. Two-terminal-pair param-
eter systems. Positive real functions. Foster and Cauer canonic forms for
R-L, R-C, and L-C networks. Conventional filter theory including constant
"K" and "m" derived filters. Bartlett's bisection theorem, the sym-
metrical lattice, and lattice-derived filters.
                                   (Offered yearly, 1st semester, 2nd term)

3.902   Electric Circuit Theory II   Prep. 3.901 Electric Circuit Theory I
R-L-C one-terminal-pair network synthesis including the Brune and
Bott-Duffin methods. Parts of network functions. Two-terminal-pair
synthesis by ladder development. The synthesis of unloaded lattices,
constant resistance lattices. Darlington's driving-point synthesis.
                                   (Offered yearly, 2nd semester, 1st term)

3.903   Electric Circuit Theory III—Synthesis   Prep. 3.902 Electric
                                                        Circuit Theory II
General network properties. Energy functions. Positive real functions.
Positive real matrices. Advanced methods for synthesis of one-port and
two-port networks. Discussion on synthesis of n-port and active net-
works. Time-domain synthesis.   (Offered yearly, 1st semester)

3.904   Electric Circuit Theory IV—Approximation Methods
                                   Prep. 3.903 Electric Circuit Theory III
Introduction to approximation problems. Criteria of approximations.
Techniques of approximation including those of Butterworth, Chebyshev,
Bessel, Pade, and so forth. Potential analogy. Approximations by sets of
orthogonal functions.   (Offered yearly, 2nd semester)

3.911   Electric Power Circuits   Prep. Polyphase A-C circuits,
                                                 A-C machinery
Review computation of line constants. Study of skin and proximity effects.
Steady-state analysis of short and long lines by analytical and graphical
means. Equivalent circuits. Power-factor correction. Interference with
communications and other circuits.   (Offered 1964-65, 1st semester)

3.912   Electric Power Circuits   Prep. 3.911 Electric Power Circuits
                                                         or equivalent
Fundamentals of symmetrical components. Study of impedance to
sequence currents of short and long transmission lines, cables, trans-
former banks, and machines. Grounding of power systems. Application
of symmetrical and related components to steady-state analysis of
balanced and unbalanced power circuits.

                                     (Offered 1964-65, 2nd semester)

3.915   Electric Power Distribution   Prep. 3.912 Electric Power Circuits
                                                 or consent of instructor
Loads and their characteristics, including distribution, density, growth,
demand, diversity factor, load factor, power factor, power and lighting
loads; types of distribution systems, D-C and A-C; primary distribution,
including radial and network, substantial location, arrangement of
primary circuits, regulation, primary voltage; secondary distribution,
including radial, network, feeders, transformers, regulation; transformer
size, location, loading connections, and characteristics; voltage regula-
tion; protective devices; overhead and underground construction.

                                     (Offered 1964-65, 1st semester)

3.920   Laser Seminar   Prep. 3.607 Lasers I or equivalent and usually
                            a Master of Science degree in Electrical Engineering,
                                 Applied Science or Physics
Special topics in current laser research will be discussed by participants
and invited speakers. The seminar is designed for those involved in laser
research or those with a very active interest. (Credit: 1 semester hour)
                                     (Offered yearly, 1st and 2nd semesters)

3.949   Seminar   Prep. Admission to electrical degree program
A library survey of a selected topic in the general field of electrical
engineering with an oral presentation based on this survey.
                                     (Offered yearly, 1st term)

3.950   Seminar   Prep. Admission to electrical degree program
The preparation of a research report suitable for publication in a pro-
fessional journal, plus an oral presentation of this report.
                                     (Offered yearly, 2nd term)

3.953-3.954 Thesis   Prep. Admission to the electrical engineering
master's degree program
Experimental work conducted under the auspices of the department.
(Offered yearly, 1st and 2nd terms)

3.970-3.971 Seminar   Prep. Admission to the electrical engineering
doctoral program
Two hours per week of discussion and presentation of subject matter
compatible with the doctoral program.
(Offered yearly, 1st and 2nd terms)

3.975 Thesis   Prep. Admission to the electrical engineering
doctoral program
Theoretical and/or experimental work conducted under the auspices of
the department.   (Offered yearly, 1st and 2nd terms)

3.980 Doctoral Reading   Prep. Admission to the electrical engineering
doctoral program
Material approved by the candidate's advisor.
(Offered yearly, 1st and 2nd terms)

Industrial Engineering

MASTER OF SCIENCE IN INDUSTRIAL ENGINEERING

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Industrial Engineering, applicants must have obtained a bachelor of science degree in some engineering field from a recognized institution. In addition, the undergraduate training should have included basic courses in accounting and management. If deficiencies in these areas exist, they must be satisfied by taking such work in courses prescribed by the departmental graduate committee. This work will be in addition to the regular degree requirements.

Program

The full-time program in industrial engineering operates on the co-operative plan as described on the page preceding the academic calendar. Thirty semester hours of work are required and will normally be distributed over four terms according to the following pattern.

FIRST YEAR

First Term		Second Term	
Required Courses	6	Required Courses	6
Elective Courses	2	Elective Courses	2
	8		8

SECOND YEAR

First Term		Second Term	
Required Courses	2	Elective Courses	4
Elective Courses	4	Thesis	2
Thesis	2		6
	8		

A faculty advisor will be appointed to approve the thesis topic and supervise its completion.

Required Courses

5.101	Analysis of the Industrial Enterprise..	2
5.108	Advanced Engineering Economy	2
5.301	Manufacturing Analysis	2
5.501	Operations Research	2
5.505	Management Information Systems	2
14.230	Probability	2
14.220	Statistics	2
5.901	Thesis	4

Electives

Six semester hours of credits must be chosen from Industrial Engineering courses. Six semester hours may be elected from courses in engineering, science or mathematics given in the Graduate School of Engineering and courses in the Graduate School of Business Administration and the Graduate School of Arts and Sciences which are approved by the Departmental Graduate Committee.

MASTER OF SCIENCE IN ENGINEERING MANAGEMENT
Evening Part-Time Program

Admission

To be enrolled for graduate work in engineering management, applicants must have obtained a bachelor of science degree in an engineering field from a recognized institution. Those who have a Bachelor of Science degree in Industrial Engineering may proceed with the program. Applicants with degrees in other engineering fields may be required to take certain prerequisite courses of Group I as determined by the Director of Graduate Study in Engineering. Such courses will carry graduate credit but will be in addition to the regular degree requirements.

Program

The program leading to the Master of Science in Engineering Management is designed for part-time students who may progress according to their abilities and the time available. Thirty semester hours of work are required of which 16 semester hours are specified.

Required Courses—Group II

5.101	Analysis of the Industrial Enterprise	2
5.102	Engineering Economy	2
5.201	Finance	2
5.202	Industrial Budgeting	2
5.203	Industrial Forecasting	2
5.301	Manufacturing Analysis	2
5.401	Marketing	2
5.601	Human Factors in Industrial Operations .	2
		16

Electives

Four semester hours must be elected from engineering management courses of Group II. Ten semester hours may be elected from any courses in engineering or science for which the student has the necessary preparation.

DESCRIPTION OF COURSES

All courses carry two semester hours of credits. Seminars and thesis may have varying credits established by the department at the time of registration. After each course title is indicated the term or semester in which it is given. "Semester" indicates that the course is given in the evening according to the semester calendar and "term" indicates that the course is given in the day according to the co-operative calendar.

GROUP I

5.150   Industrial Management   Prep. Bachelor of Science degree
in engineering

An introduction to the general problems of competitive industry and modern scientific management methods. Origin of the factory system, development of management principles and types of organizational structures; over-all policies; plant location and layout; machinery and equipment; transportation and material handling; plant services, maintenance; research, patents, design and development; manufacturing economics.   (Offered yearly, 1st and 2nd semesters)

5.152   Industrial Accounting   Prep. Bachelor of Science degree
in engineering

Introduction of basic accounting principles and procedures. Use of accounting data as a management tool. The latter part of this course is designed to provide a practical coverage of basic cost procedures related to materials, labor, and manufacturing expense control. Job order, process and standard cost systems are studied.

(Offered yearly, 1st and 2nd semesters)

5.154   Engineering Statistics   Prep. Bachelor of Science degree
in engineering

Part I of the course equates experimental results to a sample space and discusses the characteristics of discrete and continuous probability distributions including the binomial, poisson, multinominal, hypergeometric and normal probability functions. Part II covers sample statistics, hypothesis testing, simple correlation, and other statistical concepts useful in industry.   (Offered yearly, 1st and 2nd semesters)

GROUP II

5.101   Analysis of the Industrial Enterprise   Prep. Industrial management

A comprehensive study of the development and growth of industrial enterprises, both large and small, and the management philosophies which have spelled success or failure. An examination of the competitive relations of the companies within each industry. Financial statements; discussion of fourteen important operating ratios and trends in a wide range of American industry. Business failures and conclusions as to causes.

Planning to meet customers' needs calls for discussion of market and economic research, customer research, product design and styling, and of engineering research and development. Centralized policy and decentralized administration in large organizations and attendant problems are examined, and their application in smaller organizations discussed. The importance of human relations; the development of executive personnel at all levels. (Offered yearly, 1st and 2nd semesters)

5.102 Engineering Economy Prep. Bachelor of Science degree in engineering

The fundamental objective is to explain the technique of answering the "Will it pay?" question in engineering situations. The time value of money; the variance of points of view of the accountant and the engineer as affecting the solution are clearly brought out. Discussions of replacement economy include consideration of the M.A.P.I. formula and theory. (Offered yearly, 1st and 2nd semesters)

5.103 Engineering and Research Administration Prep. Admission to engineering graduate program

Current developments in the management of research activities and the background of engineering, research, and development in industry; the responsibility of management for engineering and research programs; choice of objectives and plans, magnitude of projects and programs, evaluation of research, administration of personnel; engineering and research facilities; project management; relationship of research to other functional areas of the organization. (Offered 1964-65, 1st semester)

5.104 Engineering Reports Prep. Admission to engineering graduate program

Principles stressed for achieving a readable style through modern concepts of sentence and paragraph structure. Methods analyzed for utilizing graphic aids, constructing comprehensive outlines and abstracts, and adapting to various reader levels. Application and evaluation of these principles in engineering reports and related documents.

(Offered yearly, 1st and 2nd semesters)

5.106 Executive Development Prep. 5.101 Analysis of the Industrial Enterprise

The impact of new corporate dimensions—popular ownership, professional management; public responsibility; the customer; ethical standards. The challenge of top-range planning, information for decision making, human motivation, social-political questions impinging on the business community. Managerial philosophies—decentralization and attendant problems; development of men; leading through persuasion not command; integration, teamwork, balanced communications. Sharing the vision of the future. (Offered yearly, 2nd semester)

5.108   Advanced Engineering Economy   Prep. 5.102 Engineering
                                                Economy or Equivalent
Principal emphasis on the practical application of the techniques studied
in Engineering Economy, 5.102. Problems of implementation are studied
through class discussion of cases and a major term project. Recent
advances in the techniques of engineering economy are discussed;
especially those relating to the consideration of uncertainties.

(Offered yearly, 2nd semester)

5.201   Finance   Prep. 5.101 Analysis of the Industrial Enterprise
The financial structure of the American economy and of the financial
organization of business units. An analysis of the basic principles
governing the financial operations of business, including administrative
tools of financial management and the principles and instruments of
short-term and long-term financing. A review of such topics as methods
of evaluating a business, promotion, expansion, consolidation, refinanc-
ing, and reorganization.   (Offered yearly, 1st and 2nd semesters)

5.202   Industrial Budgeting   Prep. 5.152 Industrial Accounting
                                        or equivalent
Budgeting plans, programs, and reports for industry today. An introduc-
tion to the essentials of fixed and variable budgeting for sales, pro-
duction, inventory, cash, capital, and cost-volume-profit analysis.

(Offered yearly, 1st and 2nd semesters)

5.203   Industrial Forecasting   Prep. Admission to engineering
                                          graduate program
The forecast of gross material production and its principal components:
consumption, investment, government expenditure, inventories, and
construction. Equal attention given to forecasting for the particular
firm and industry.   (Offered yearly, 1st and 2nd semesters)

5.301   Manufacturing Analysis   Prep. 5.154 Engineering Statistics
                                          or equivalent
Study of the development of conceptual models to represent industrial
operations and study of the usefulness and limitations of such models
provides an introduction to the more intensive treatment that will be
provided in the Operations Research sequence that follows as an elective
area. Models included are process flow charts, Gantt charts, and other
schematic models as well as more intensive study into mathematical
models such as linear programming, Monte Carlo analysis, and total
value analysis. Some aspects of the use of large computers in the
treatment of such models is studied.

(Offered yearly, 1st and 2nd semesters)

5.302   Quantitative Analysis for Materials Handling   Prep. 5.154
Engineering Statistics or equivalent
Problems involving the movement of materials within an industrial plant
are considered in the light of conventional techniques such as flow
process charts, diagrams, travel charts in addition to the application
of such concepts as queuing theory, conveyor theory, Monte Carlo
simulation and linear programming. Case studies considered.
(Offered 1965-66, 2nd semester)

5.304   Advanced Work Measurement   Prep. Bachelor of Science
degree in industrial engineering or equivalent
A critical evaluation of methods study and work measurement pro-
cedures. A study of techniques including standard data, work sampling,
predetermined time systems (MTM, Work Factor, BMT, DMT), merit
rating, factor method, past performance data employing analysis by
least squares and multiple correlation. Case studies on financial and
non-financial incentives such as indirect workers, clerical, technical,
and maintenance.   (Offered 1964-65, 1st semester)

5.305   Design of Experiments   Prep. 14.220 Statistics
Use and analysis of experimental designs such as randomized blocks
and Latin squares; analysis of variance and covariance; factorial ex-
periments; statistical problems associated with finding best operating
conditions; response surface analysis. (Offered 1965-66, 1st semester)

5.401   Marketing   Prep. Admission to engineering graduate program
Introduction to managerial problems in marketing operations, emphasiz-
ing possibilities of gaining insight into the underlying determinants and
dynamics of consumer and industrial demand behavior through the
medium of social and economic research. Basic policy considerations
through which marketing management may adopt operations of firm to
changing market environment; selection and control of channels of
distribution, product line, pricing and sales promotion policy. Theoretical
concepts and quantitative techniques applied in study of marketing
phenomena.   (Offered yearly, 1st and 2nd semesters)

5.501   Operations Research   Prep. 5.301 Manufacturing Analysis
(This course is not recommended for students who are interested
in the material of 5.503 Operations Research for Management.)
The development of mathematical models for industrial decision prob-
lems. The course will include the study of queuing, inventory control, and
Markov process models, linear and dynamic programming, the influence
of uncertainty in mathematical models including emphasis on total
value and incremental analysis problems. Study of actual problem
situations is emphasized.   (Offered yearly, 2nd semester)

5.503   Operations Research for Management   Prep. 5.101
Analysis of the Industrial Enterprise

The executive as a problem-solver and decision-maker. Statistical decision theory, optimal decisions, and the value of information. Executive judgment and subjective probabilities. Operations research provides analysis for the management decision process. Operations research in concept and practice. Industrial decision systems. Some applications in marketing, production, and finance.

(Offered yearly, 1st semester)

5.504   Inventory Control and Production Planning   Prep. 5.154
Engineering Statistics or equivalent

The design and operation of inventory systems from a scientific management point of view, including both required theory and practical aspects. Subjects include inventory control models, statistical forecasting, production scheduling techniques, distribution systems, management control and reports, discussion of actual systems and a case study.

(Offered yearly, 2nd semester)

5.505   Management Information Systems   Prep. Admission to
engineering graduate program

The design and effective utilization of industrial information systems for management decision-making. Although emphasis is placed upon the integrated use of electronic computers in such systems, manual systems are considered where they are the only economic and feasible solution. Effective data collection, reduction and storage are considered along with determining the appropriate information content to be summarized for intelligent decision-making.   (Offered yearly, 2nd semester)

5.506   Queuing Theory and Its Applications   Prep. 5.154 Engineering
Statistics or 14.230 Probability

Definition of the queuing process, applications of queuing to practical problems with exponential or Erlang arrival and service distributions, detailed study of the one-server problem, multi-server problems, bulk service, queues in series, applications to such problems as scheduling, maintenance, inventory and plant design.

(Offered 1965-66, 1st semester)

5.507   Industrial Simulation   Prep. Admission to engineering
graduate program

Introduction to the Monte Carlo technique with review of random processes, logic of simulation and flow graphing, and testing of the validity of simulation model. Applications drawn from problems in inventory, marketing, job shop scheduling, and others.   (Offered yearly, 1st semester)

5.508   Mathematical Programming   Prep. 5.501 Operations Research
Covers in depth techniques and theory contained in linear, quadratic,
and nonlinear programming which would include sensitivity analysis, the
dual theorem, parametric programming, and problems involving un-
certainty.   (Offered yearly, 2nd semester)

5.509   Principles of Control Systems   Prep. Admission to engineering
graduate program
The concepts of industrial dynamics and feedback control theory are
used in class and in a term project to study dynamic management
systems. The steps in the problem solving procedure of problem identifi-
cation, casual hypothesis, model building, model analysis, model improve-
ment, implementation and evaluation are treated in the feedback
system context. Amplification, cycle generation, lead-lag relationships
and growth dynamics in management systems are analysed.

(Offered yearly, 2nd semester)

5.510   Data Processing   Prep. Engineering degree, basic course
in accounting
Study of the digital computer and ancillary equipment for solving manage-
ment problems. FORTRAN will be taught for use in programming. Other
compiler languages will be discussed including ALGOL, COBOL, MAD.
Use of computer vs. other equipment such as sorter, collater, tab will be
discussed. Data processing problems will be handled on project basis.
Field trip to local installation.   (Offered yearly, 2nd semester)

5.601   Human Factors in Industrial Operations   Prep. Admission to
engineering graduate program
A general coverage of the design of equipment and systems for human
use, the facts and principles of personnel procedures in business and
industry and the knowledge and methods in the management of human
relations problems. Topics include basic sensory and motor capabilities
of the human operator, personnel screening and selection, and morale
and motivation.   (Offered yearly, 1st and 2nd semester)

5.602   Seminar in Contemporary Industrial Problems   Prep. Admission
to engineering graduate program
Industrial and economic problems in our economy. Appraisal of govern-
ment policies, labor power, technological advances, and foreign compe-
tition including the Communist challenge. (Offered yearly, 2nd semester)

5.603   Labor-Management Relations   Prep. Admission to engineering
graduate program
A survey of labor-management with emphasis on current problems. A
brief examination of the history and government of trade unionism.

Greater attention will be devoted to a study of current labor laws, the elements of collective bargaining negotiations, and the settlement of industrial disputes.   (Offered yearly, 2nd semester)

5.701   Mathematical Theory of Reliability   Prep. 5.154 Engineering
Statistics or 14.230 Probability or equivalent

An introduction to the mathematical techniques utilized in systems reliability analysis, reliability prediction, reliability allocation, reliability estimation, and reliability acceptance testing for the development of reliable products both military and commercial. Reliability probability functions, measures of reliability, active and standby redundancy with or without repair, spares planning, and availability are also presented.

(Offered yearly, 1st semester)

5.901   Thesis

Analytical and/or experimental work conducted under the auspices of the department.   (Offered yearly)

Mechanical Engineering

THE MASTER'S DEGREE

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Mechanical Engineering, applicants must have obtained a Bachelor of Science degree in Mechanical Engineering from a recognized institution. Applicants with a bachelor's degree in other fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

Full-Time Program on Co-operative Plan

The full-time program in mechanical engineering operates on the Co-operative Plan as described on the page preceding the academic calendar. Options are available in either mechanics or heat. In both programs the thirty semester hours of work are normally distributed over four terms. The program of each student will be made up from the required and elective courses available in each term and approved by the departmental graduate committee. A thesis of four semester hours of credits is elective with the approval of the departmental graduate committee.

MECHANICS MAJOR
Required Courses 1964-1965

	First Term			Second Term	
*2.201	Theory of Elasticity .	2	*2.202	Theory of Elasticity	2
2.213	Advanced Dynamics	2	2.214	Advanced Dynamics	2
*2.211	Vibration Theory & Applications	2	*2.212	Vibration Theory & Applications	2
	or			or	
2.221	Fluid Dynamics		2.222	Fluid Dynamics	
14.101	Advanced Mathematics	2	14.102	Advanced Mathematics	2
	or				
14.230	Probability		2.903, 4	Seminar	1
2.903, 4	Seminar	1		Elective Courses ...	6
	Elective Courses ...	6			15
		15			

HEAT MAJOR
Required Courses

	First Term			Second Term	
*2.301	Heat Transfer	2	*2.302	Heat Transfer	2
2.311	Advanced Thermodynamics	2	2.312	Advanced Thermodynamics	2
2.221	Fluid Dynamics	2	2.222	Fluid Dynamics	2
14.101	Advanced Mathematics	2	14.102	Advanced Mathematics	2
	or		2.903, 4	Seminar	1
14.230	Probability			Elective Courses	6
2.903, 4	Seminar	1			15
	Elective Courses	6			
		15			

Elective Courses for Mechanics or Power Majors

	First Terms		Second Terms
*2.201	Theory of Elasticity	*2.202	Theory of Elasticity
*2.205	Experimental Stress Analysis	*2.203	Advanced Mechanics of Materials
*2.211	Vibration Theory & Applications	*2.212	Vibration Theory & Applications
2.213	Advanced Dynamics	2.214	Advanced Dynamics
2.221	Fluid Dynamics	2.222	Fluid Dynamics
2.232	Orbital & Ballistic Mechanics	2.233	Orbital & Ballistic Mechanics
*2.301	Heat Transfer	*2.302	Heat Transfer
2.311	Advanced Thermodynamics	*2.312	Advanced Thermodynamics
*2.701	Physical Metallurgy	*2.702	Physical Metallurgy
2.901	Thesis	2.902	Thesis

Starred courses are offered during 1964-1965. Unstarred courses are offered during 1965-1966, with the exception of 14.101, 14.102, 2.901, 2.902, 2.903, and 2.904 which are offered yearly.

A limited amount of work may be elected from the evening part-time program.

Evening Part-Time Programs

The admission requirements for these programs are the same as for the full-time program, but students may progress according to their abilities and the time available. Students who have not had the equivalent of 14.101 Advanced Mathematics must register for this course as their mathematics elective.

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

Required Courses

Mechanics Major

2.201	Theory of Elasticity .	2
2.202	Theory of Elasticity .	2
2.213	Advanced Dynamics	2
2.214	Advanced Dynamics	2
2.211, 212	Vibration Theory	4
	or	
2.221, 222	Fluid Dynamics	
14.101	Advanced Mathematics	2
	or	
	Mathematics Elective	
14.102	Advanced Mathematics	2
		16

Heat Major

2.301	Heat Transfer	2
2.302	Heat Transfer	2
2.311	Advanced Thermodynamics . .	2
2.312	Advanced Thermodynamics . .	2
2.221	Fluid Dynamics . . .	2
2.222	Fluid Dynamics . . .	2
14.101	Advanced Mathematics	2
	or	
	Mathematics Elective	
14.102	Advanced Mathematics	2
		16

Electives

Eight semester hours must be elected from mechanical engineering courses. Six semester hours may be elected from any courses in engineering or science for which the student has the necessary preparation.

DESCRIPTION OF COURSES

All courses carry two semester hours of credits. Seminars and thesis may have varying credits established by the department at the time of registration. After each course title is indicated the term or semester in which it is given. "Semester" indicates that the course is given in the evening according to the semester calendar and "term" indicates that the course is given in the day according to the co-operative calendar.

2.200   Advanced Mechanics of Materials   Prep. Strength of materials
Stresses at a point, theories of failure, thick cylinders under elastic and plastic deformation, shear stress distribution, location of shear center,

bending stresses due to nonsymmetrical loading, bending of flat plates, curved beams, the significance of fatigue, stress concentration, the resistance of materials to stress. Experimental methods and practical problems are discussed. (Offered yearly, 1st and 2nd semesters)

2.201 Theory of Elasticity Prep. One year of strength of materials, 14.101 Advanced Mathematics (may be taken simultaneously)

Analysis of stress and strain in two and three dimensions, principal stresses and strains, differential equations of equilibrium, boundary conditions, compatibility equations, stress function, determination of displacements, equilibrium conditions in terms of displacements. Solution of problems in two dimensions. (Offered yearly, 1st semester and 1964-65, 1st term)

2.202 Theory of Elasticity Prep. 2.201 Theory of Elasticity
A continuation of 2.201 with application to the solution of problems in three dimensions. (Offered yearly, 2nd semester and 1964-65, 2nd term)

2.203 Advanced Mechanics of Materials Prep. Differential equations and 2.200 Advanced Mechanics of Materials

Buckling of compression members with and without transverse loads; comparison of general design expression for columns; lateral stability of beams; slope deflection and moment distribution of non-prismatic beams; solution of plates by grid analogy.
(Offered yearly, 2nd semester and 1964-65, 2nd term)

2.204 Plasticity and Creep Prep. 2.200 Advanced Mechanics of Materials or equivalent, 2.202 Theory of Elasticity

Stress and strain, types of deformation, elasticity, plasticity, creep, mechanical equation of state, plastic flow under multi-axial stress, anelastic creep. Relationship of comparatively simple laboratory material tests to more complex service conditions will be emphasized.
(Offered yearly, 1st semester)

2.205 Experimental Stress Analysis Prep. 2.200 Advanced Mechanics of Materials or equivalent

Theoretical and practical consideration of methods of determining stress distributions. The fundamental theory basic to the various methods will be emphasized and a comparison of the results obtainable by these methods will be made. Photoelasticity, brittle lacquers, strain gauge techniques, and instrumentation are a few of the methods given consideration. (Offered yearly, 1st semester and 1964-65, 1st term)

2.206 Plates and Shells Prep. 2.202 Theory of Elasticity
Bending of plates with various shapes, loads and supports. Large deflection of plates. Membrane theory of shells. Analysis of cylindrical shells. General theory of thin elastic shells. Shells of revolution.
(Offered yearly, 1st semester)

2.209   Engineering Analysis   Prep. B.S. in Engineering
Formulation of mathematical models of engineering systems. Examples
chosen from solid and fluid mechanics, heat transfer and electrical cir-
cuits. Classification of the problems as to their mathematical and phys-
ical nature. Means of obtaining practical solutions including finite
difference and variational methods.   (Offered yearly, 2nd semester)

2.211   Vibration Theory and Applications   Prep. Differential equations,
dynamics
Single degree of freedom; damping, forced vibration, resonance, phase
relationships, vibration isolation, multiple degrees of freedom; free and
forced vibration with and without damping, extensional and torsional
oscillations, frequency equation, energy in a vibrating system, energy
methods of solution, Rayleigh's Method.
(Offered yearly, 1st semester and 1964-65, 1st term)

2.212   Vibration Theory and Applications   Prep. 2.211 Vibration
Theory and Applications
A continuation of 2.211 including systems with distributed mass and
stiffness, mobility and impedance methods, shock and impact, balancing
of rotating machinery, vibration of asymmetrical shafts, nonlinear vibra-
tions, vibration measurements.
(Offered yearly, 2nd semester, and 1964-65, 2nd term)

2.213   Advanced Dynamics   Prep. Dynamics, 14.101 Advanced
Mathematics (may be taken simultaneously)
Application of fundamental laws of motion. Dynamics of a particle, recti-
linear motions in a resisting medium, linear and nonlinear vibrations,
motion of a projectile. Linear and angular momentum, impact, kinetic
energy and work.   (Offered yearly, 1st semester, and 1965-66, 1st term)

2.214   Advanced Dynamics   Prep. 2.213 Advanced Dynamics 14.102
Advanced Mathematics (may be taken simultaneously)
Further applications of laws of motion. Dynamics of systems with con-
straints, generalized coordinates, LaGrangian Equations, Hamilton's
Principle, Euler's Equations, rotation of a rigid body, gyroscopes, dynam-
ical problems using analog computer.
(Offered yearly, 2nd semester, and 1965-66, 2nd term)

2.215   Shock, Vibration, and Noise Control   Prep. 2.212 Vibration
Theory and Applications
Theoretical and practical considerations pertinent to the design and pro-
tection of structures and equipment subject to severe environments of
transient shock, steady state vibration, random vibration and acoustic
noise. Particular subjects include random vibration spectral density,

Fourier spectra, shock spectra, equipment fragility, shock and vibration isolation materials and techniques, coupled and decoupled modes, wave effects, structural damping and noise transmission.

(Offered yearly, 1st semester)

2.221 Fluid Dynamics   Prep. Hydraulics, dynamics,
                                              14.102 Advanced Mathematics
Principles of incompressible fluid flow in two and three dimensions, stream function, velocity potential, application of complex variables, analytic functions, orthogonal nets, conformal maps, two and three dimensional flow problems.

(Offered yearly, 1st semester and 1965-66, 1st term)

2.222 Fluid Dynamics   Prep. 2.221 Fluid Dynamics
Compressible flow, review of thermodynamics, one dimensional isentropic flow, flow of channels, normal and oblique shockwaves, linearized equation of motion, small perturbation method, Prandtl-Meyer flow, airfoil in supersonic flow, three dimensional flow. Effects of viscosity, Navier-Stokes equation, some exact solutions, layer theory, laminar and turbulent flow, flow along flat spates and in pipes, transition, separation.

(Offered yearly, 2nd semester and 1965-66, 2nd term)

2.223 Gas Dynamics   Prep. 2.222 Fluid Dynamics
Laws of thermodynamics, conservation laws in fluid flow, pressure waves, acoustic waves, finite waves. Rayleigh's equation for a perfect gas, transonic flow past smooth two-dimensional shapes, two-dimensional linearized flow, Prandtl-Glauert Rules. Two-dimensional transonic flow, von Karman's Rules. Supersonic flow over a wedge, the virial theorem of Clausius, flow through a shock wave, the Hodograph transformation. The Maxwell's proof of the law of distribution of velocity. Couette flow of a highly rarefied gas, gas in a steady state, Maxwell's equation of transfer, the Lorentz-Enskog analysis, fluctuations.   (Offered yearly, 1st semester)

2.232 Orbital and Ballistic Mechanics   Prep. 14.101 Advanced
                                                          Mathematics
Orbit mechanics dealing with the two body problem of unpowered coasting orbits, impulsive powered flight, boost phase of powered flight, low thrust powered trajectories of powered flight, re-entry vehicles.

(Offered yearly, 1st semester and 1965-66, 1st term)

2.233 Orbital and Ballistic Mechanics   Prep. 2.232 Orbital and
                                                          Ballistic Mechanics
A continuation of the first course with emphasis on vehicle design considerations based on component technologies.

(Offered yearly, 2nd semester and 1965-66, 2nd term)

2.234 Dynamics of Re-entry Vehicles   Prep. 2.232 Orbital and
Ballistic Mechanics or equivalent

Rigid vehicle kinematics, basic vehicle dynamics, definition & trans-
formation of various axes systems associated with the vehicle motion,
re-entry aerodynamic forces and heating, approximate solutions of
entry dynamics, applications of fundamental theory of industrial prob-
lems of re-entry vehicle dynamics.   (Offered yearly, 1st semester)

2.235 Advanced Dynamics of Re-entry Vehicles   Prep. 2.234,
Dynamics of Re-entry Vehicles

Effects of aerodynamic non-linearities on vehicle dynamics, ballistic and
lifting entry into planetary atmospheres, dynamics of spinning re-entry
vehicles, special problems on re-entry vehicle dynamics in vacuum,
hypersonic, transonic, and subsonic flight regimes.

(Offered yearly, 2nd semester)

2.301 Heat Transfer   Prep. Elements of Heat Transfer,
14.102 Advanced Mathematics

Basic laws of heat transfer; steady state heat conduction, systems with
sources, transient heat conduction; graphical, numerical and analogical
methods; thermal radiation, radiation combined with convection and con-
duction, radiation from gases; solar, terrestrial and atmospheric radiation.
(Offered yearly, 1st semester and 1964-65, 1st term)

2.302 Heat Transfer   Prep. 2.301 Heat Transfer

Fundamentals of convection; dimensional analysis; Reynolds, Prandtl and
Nusselt numbers; Reynolds analogy; elements of boundary layer theory;
free convection, forced convection, boiling and condensation, Nusselt's
derivation; heat exchangers; analogy of heat and mass transfer.
(Offered yearly, 2nd semester and 1964-65, 2nd term)

2.311 Advanced Thermodynamics   Prep. Thermodynamics,
Differential Equations

A critical examination of classical thermodynamics from an engineering
point of view, emphasizing the fundamental concepts, temperature, the
first and second law of thermodynamics, entropy, with selected topics
such as irreversibility and availability, entropy and probability, thermo-
electric phenomena, the Kelvin equations, the Clapeyron equations,
Joule-Thomson and Joule expansions, and including an introduction to
kinetic theory and statical thermodynamics. (Offered yearly, 1st semester, and 1965-66, 1st term)

2.312 Advanced Thermodynamics   Prep. 2.311
Advanced Thermodynamics

A continuation of 2.311, extending the critical examination of the
fundamental thermodynamic concepts, including the general thermo-
dynamics equations, compressibility factor, deviation equations for

real gases, equilibrium and the third law, and selected topics in kinetic theory and statistical mechanics, fluid flow and thermochemistry.

(Offered yearly, 2nd semester, and 1965-66, 2nd term)

2.333 Direct Energy Conversion Prep. 2.312
Advanced Thermodynamics
The motivation for the development of direct energy conversion devices. Fundamental aspects and engineering considerations for MHD systems and thermionic conversions will be studied in detail.

(Offered yearly, 1st semester)

2.334 Direct Energy Conversion Prep. 2.333 Direct Energy Conversion
A continuation of 2.333 which will consider thermoelectric generators and refrigerators, Nernst-Ettinghausen devices, and fuel cells.

(Offered yearly, 2nd semester)

2.401 Pumps Prep. Hydraulics
Deals mainly with centrifugal pumps, with brief references to other types: flow of fluids in pipes and conduits, system curves, pump head; velocity diagrams and head development, efficiency; specific speed, net positive suction head, cavitation; affinity laws, selection of pumps to suit various operating conditions and methods of driving, parallel operation; automatic operation, types of construction and materials used, methods of priming centrifugal pumps, pumping of chemicals, oils, and sludges, special problems of pump installation and operation, water hammer in pump discharge lines. (Offered yearly, 1st semester)

2.402 Fans and Blowers Prep. Thermodynamics
Flow of air in pipes and ducts, fan characteristics and laws, various types of fan wheels, inlet and outlet connections, fan capacity control, fan selection and testing. Compression of air and gases, flow in pipes, head on blowers, performance curves, effect of changes in speed and inlet conditions, construction, regulation, selection, installation, and testing. Axial flow fans and blowers. Positive pressure blowers.

(Offered yearly, 2nd semester)

2.503 Power Plant Economics and Design Prep. Thermodynamics
An integrated study into the economic and design consideration for both isolated and central station systems. (Offered yearly, 1st semester)

2.504 Power Plant Economics and Design Prep. 2.503 Power Plant
Economics and Design
A continuation of 2.503. Latest developments in the economic aspects of nuclear, MHD, and supercritical power generation with special consideration to design problems. (Offered yearly, 2nd semester)

2.531 Thermoelectrics Prep. 2.312 Advanced Thermodynamics
After introducing the Kelvin relations and semiconductor physics, the performance of thermoelectric refrigerators, heat pumps, and generators will be developed. Emphasis on the engineering problems involved is given to cascading and dynamic behavior.

(Offered 1965-66, 2nd semester)

2.701 Physical Metallurgy Prep. Engineering materials
Introduction to physical metallurgy encompassing crystallography; equilibrium and nonequilibrium phase studies for 1, 2 and 3 component systems; theory of mechanical working of metals including elastic and plastic deformation, impact, fatigue, and creep; and theories of relieving work effects including recovery, recrystallization, and grain growth.

(Offered yearly, 1st semester, and 1964-65, 1st term)

2.702 Physical Metallurgy Prep. 2.701 Physical Metallurgy
The application of physical metallurgy theories to the study of the chemical and physical properties of iron, cast iron, steel, copper and nickel base alloys, aluminum, magnesium, and titanium.

(Offered yearly, 2nd semester, and 1964-65, 2nd term)

2.707 Process Metallurgy Prep. Engineering materials
Introduction to process metallurgy encompassing production of metals from their ores; stoichiometric principles; metallurgical thermodynamics including the first, second and third laws; and the application of thermodynamics to metallurgical reactions. (Offered 1964-65, 1st semester)

2.708 Process Metallurgy Prep. Engineering materials and 2.707
Process Metallurgy
The application of metallurgical thermodynamics to the study of melting and casting processes; hot and cold working processes; welding and alloy processes; mechanical working, cleaning and plating; gauging inspection and nondestructive testing. (Offered 1964-65, 2nd semester)

2.709 Advanced Physical Metallurgy Prep. Calculus and one year of
physical chemistry, or 2.702 Physical Metallurgy
The structure of atoms; aggregates of atoms; i.e., structure of liquid and solid metals and alloys; structure—insensitive properties, i.e., mechanical, thermal, electrical, and magnetic; imperfections in crystals, i.e., point, lime (dislocations), and surface types; structure—sensitive properties, i.e., plastic deformation, creep, anelasticity, fracture.

(Offered 1965-66, 1st semester)

2.710 Advanced Physical Metallurgy Prep. Calculus and one year of
physical chemistry, or 2.702 Physical Metallurgy
Changes of state, i.e., solidification, nucleation, growth, segregation; deformation, radiation damage and recovery processes; solid-state trans-

formations, i.e., diffusionless processes, diffusion, precipitation processes, order—disorder changes, reactions with environments.

(Offered 1965-66, 2nd semester)

2.720   Physical Ceramics   Prep. Physical chemistry, or solid state
physics, or 2.702 Physical Metallurgy

Introduction to ceramic fabrication processes. Characteristics of vitreous and crystalline solids, structural imperfections, and atomic mobility. Phase equilibria, nucleation, crystal growth, and solid-state reactions, nonequilibrium phases, and effects on the resulting microstructure of ceramics.   (Offered yearly, 1st semester)

2.721   Properties of Ceramics   Prep. 2.720 Physical Ceramics

Discussion of effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials.   (Offered yearly, 2nd semester)

2.730   Material Science and Engineering   Prep. Physical
Metallurgy or equivalent

Principles underlying the observed properties of solid materials. The relationships of these principles to the properties and to applications in structures and devices. Both macroscopic-Phenomological and electronic-molecular approaches will be used. Materials will include metals and alloys, semiconductors, dielectrics; crystalline and noncrystalline. Typical topics are atomic and electronic structures; imperfections; microstructure; elasticity, anelasticity, and plasticity; nucleation and growth; diffusion; solidification; ordering.   (Offered yearly, 1st semester)

2.731   Material Science and Engineering   Prep. 2.730 Material
Science and Engineering

A continuation of 2.730 into additional topics such as thermal, electric, magnetic, and optical properties; applications of solid state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth.   (Offered yearly, 2nd semester)

2.801   Fundamentals of Instrumentation   Prep. Bachelor
of Science Degree

Theoretical principles underlying the design and operation of instruments for measurement and/or control. Analysis of stimulus-response relations. Industrial instruments for measurement and control, including those based on pneumatic and electrical mechanisms.

(Offered yearly, 1st semester)

2.802   Industrial Process Control   Prep. 2.801 Fundamentals
of Instrumentation

Fundamental principles involved in automatic control of industrial processes. Economic considerations. Application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, pH.   (Offered 1964-65, 2nd semester)

2.803   Automatic Control Engineering   Prep. Differential Equations, Dynamics

Formulation of transfer functions and block diagrams representing physical systems. Study of feedback effects in a wide variety of systems. Transient and frequency response. Laplace transform techniques. Stability criteria, root locus.   (Offered yearly, 1st semester)

2.804   Automatic Control Engineering   Prep. 2.803 or equivalent

General theory of Automatic Control. Linear and nonlinear systems. Multiple inputs and lead disturbances. Techniques for improving system performance. Study of characteristics of components used in systems with high dynamic performance; Hydraulic and pneumatic control valves, pneumatic power amplifiers, etc.   (Offered yearly, 2nd semester)

2.901-2.902   Thesis

Analytical and/or experimental work conducted under the auspices of the department.   (Offered yearly, 1st and 2nd terms)

2.903-2.904   Mechanical Engineering Seminar

Discussion of topics of current interest in the field of mechanical engineering.   (Offered yearly, 1st and 2nd terms)

*Graduate School
of
Pharmaceutical Sciences*

PHARMACEUTICAL SCIENCES PROGRAMS

The curricula and admission requirements for the programs leading to the Master of Science degree are described separately under the different fields of specialization:

Industrial Pharmacy
Hospital Pharmacy
Medicinal Chemistry
Pharmacology

All four day-programs are based on full-time Graduate Co-operative Plans. These two-year day-programs are the first ones in the United States requiring the acquisition of practical experience through service in regular paying jobs in the particular field of study as part of the education. Students alternate periods of classes and laboratory exercises with periods of employment activities in their major field of specialization. The latter ones are secured at cooperating hospitals, pharmaceutical research and development laboratories or by participation in research projects conducted at Northeastern University.

During each of two school years, each student has two ten-week terms of classes at Northeastern. Within these two years of graduate study, there are, in addition, three ten-week terms and one twenty-two week summer term of co-operative employment.

The University Department of Co-operative Education makes the arrangements for the employment of the graduate students. Salaries during the employment periods are commensurate with full-time weekly starting salaries, and are usually more than sufficient to cover living expenses during the employment periods so that savings can be carried over and applied towards tuition or living expenses during the periods in class at Northeastern University. In deserving cases, fellowships in the total amount of $2,400.00 may be made available to further assist with the expenditures during the study periods in college.

Students present the results of their scientific literature studies and experiments during Seminar sessions. Such reports are submitted to the Committee on Graduate Study in Pharmaceutical Sciences and are accepted in lieu of an M.S. Thesis.

Application forms and further information are obtainable from the Director, Graduate School of Pharmaceutical Sciences, Northeastern University, 360 Huntington Avenue, Boston, Massachusetts, 02115. The completed forms should be returned to the same address before April 15, of the year in which the student plans to start the program.

ACADEMIC CALENDAR

GRADUATE CO-OPERATIVE PROGRAMS
July 1964–June 1965

Registration for both Division A and B First and Second Year Students	Monday-Friday	July 13-Sept. 11
Labor Day, Office Closed	Monday	Sept. 7
Classes Begin for Division A Students	Monday	Sept. 14
Columbus Day, No Classes	Monday	October 12
Veterans' Day, No Classes	Wednesday	Nov. 11
Final Examination Period for all Division A Students	Monday-Friday	Nov. 16-Nov. 20
Classes Begin for Division B Students	Monday	Nov. 23
Thanksgiving, No Classes	Thursday-Friday	Nov. 26-27
Classes End at 5 p.m. for Christmas Holiday	Tuesday	Dec. 22
Classes Resume after Holiday at 9 a.m.	Monday	Dec. 28
New Year's Day, No Classes	Friday	Jan. 1
Final Examination Period for All Division B Students	Monday-Friday	Jan. 25-Jan. 29
Registration for Division A and Division B Students	Monday-Friday	Jan. 4-Jan. 29
Second Term Classes Begin for Division A Students	Monday	Feb. 1
Classes End at 5 p.m. for Washington's Birthday Recess	Friday	Feb. 19
Classes Resume after Recess at 9 a.m.	Thursday	Feb. 25
Thesis Due for Second Year Division B Students	Monday	March 22
Final Examination Period for all Division A Students	Monday-Friday	Apr. 5-Apr. 9
Second Term Classes Begin for Division B Students	Monday	Apr. 12
Patriots' Day, No Classes	Monday	Apr. 19
Memorial Day	Monday	May 31
Thesis due for Second Year Division A Students	Tuesday	Jun. 1
Final Examination Period for all Division B Students	Monday-Friday	June 7-June 11
Commencement	Sunday	June 20

COMMITTEE ON GRADUATE STUDY
IN
PHARMACEUTICAL SCIENCES

Bernard J. Brent, Ph.D., Chairman — Director of the Graduate School of Pharmaceutical Sciences and Professor of Medicinal Chemistry

Russell E. Brillhart, D.Sc. — Professor of Pharmacognosy

O. James Inashima, Ph.D. — Professor of Pharmacology

LeRoy C. Keagle, Ph.D. — Dean of Pharmacy

George M. Krause, M.S. — Associate Professor of Pharmacy

Everett R. Rand, M.S. — Assistant Professor of Co-operative Education

John F. Reinhard, Ph.D. — Professor of Pharmacology

Arthur A. Vernon, Ph.D. — Dean of the Graduate Division

FACULTY

Floyd E. Anderson
Associate Professor of Medicinal
Chemistry

Bernard J. Brent
Director of the Graduate School of
Pharmaceutical Sciences and
Professor of Medicinal Chemistry

Russell E. Brillhart
Professor of Pharmacognosy

Samuel Fine
Associate Professor of Electrical
Engineering

Frank R. Gonet
Assistant Professor of Medicinal
Chemistry

O. James Inashima
Professor of Pharmacology

LeRoy C. Keagle
Dean of Pharmacy and
Professor of Pharmacy

George M. Krause
Associate Professor of Pharmacy

John F. Reinhard
Professor of Pharmacology

Nathan W. Riser
Professor of Biology and Chairman
of the Department

Robert A. Shepard
Professor of Chemistry and Chair-
man of the Department

Elliot Spector
Associate Professor of
Pharmacology

Harold L. Stubbs
Professor of Mathematics and
Chairman of the Department

Joseph M. Theodore, Jr.
Assistant Professor of Pharmacy

John Webb
Lecturer in Hospital Pharmacy

Hospital Pharmacy

MASTER OF SCIENCE DEGREE

Admission

To be considered for graduate work in Hospital Pharmacy, applicants must have obtained a Bachelor of Science degree in Pharmacy from a College of Pharmacy accredited by The American Council on Pharmaceutical Education.

Prerequisite for classification as regular student: Satisfactory completion of a course in Differential and Integral Calculus at an acceptable institution.

Full-Time Day Program on Co-operative Plan

The Graduate Program in Hospital Pharmacy operates on the Co-operative Plan as described on the page preceding the Academic Calendar. A minimum of 36 semester credit hours of instruction is required for the degree. These credit hours will normally be distributed over four terms according to the following pattern:

First Year

First Term				Second Term		
76.101	General Hospital Administration I	1		76.111	Hospital Pharmacy Administration I	1
71.101	Manufacturing Pharmacy I	2		71.102	Manufacturing Pharmacy II	2
71.111	New Product Development I	2		71.112	New Product Development II	2
11.61	Physical Chemistry I (or Electives)	3		11.62	Physical Chemistry II (or Electives)	3
	Electives	1			Electives	1
71.121	Pharmaceutical Literature	0				9
		9				

Second Year

Third Term				Fourth Term		
76.102	General Hospital Administration II	2		76.112	Hospital Pharmacy Administration II	2
72.131	Radioactive Medicinals	2		72.121	Drug Analysis, Advanced	2
	Electives	5			Electives	5
71.131	Seminar	0		71.132	Seminar	0
		9				9

Electives

14.220	Statistics	2
14.230	Probability	2
71.103	Manufacturing Pharmacy III	2
71.104	Manufacturing Pharmacy IV	2
71.113	New Product Development III	2
71.114	New Product Development IV	2
72.101	Medicinal Chem. Advanced I	2
72.102	Medicinal Chem. Advanced II	2
72.103	Medicinal Chem. Advanced III	2
72.104	Medicinal Chem. Advanced IV	2
73.101	Pharmacology Advanced I	2
73.102	Pharmacology, Advanced II	2
73.103	Pharmacology, Advanced III	2
73.104	Pharmacology, Advanced IV	2
73.121	Biochemistry, Advanced I	2
73.122	Biochemistry, Advanced II	2
73.131	Toxicology	2
73.151	Pharmacological Electronics	2
73.161	Drug Metabolism	2
73.171	Bionucleonics	1
73.181	Antibiotics	2
73.191	Biologicals and Allergens	2
11.63	Physical Chemistry III	3
11.64	Physical Chemistry IV	3

Industrial Pharmacy

MASTER OF SCIENCE DEGREE

Admission

To be considered for graduate work in Industrial Pharmacy, applicants must have obtained a Bachelor of Science degree in Pharmacy from a College of Pharmacy accredited by The American Council on Pharmaceutical Education.

Prerequisite for classification as regular student: Satisfactory completion of a course in Differential and Integral Calculus at an acceptable institution.

Full-time Day Program on Co-operative Plan

The Graduate Program in Industrial Pharmacy operates on the Co-operative Plan as described on the page preceding the Academic Calendar. A minimum of 36 semester credit hours of instruction is required for the degree. These credit hours will normally be distributed over four terms according to the following pattern:

First Year

First Term			Second Term		
71.101	Manufacturing Pharmacy I	2	71.102	Manufacturing Pharmacy II	2
71.111	New Product Development I	2	71.112	New Product Development II	2
72.101	Medicinal Chem. Advanced I	2	72.102	Medicinal Chem. Advanced II	2
11.61	Physical Chem. I (or Electives)	3	11.62	Physical Chem. II (or Electives)	3
71.121	Pharmaceutical Literature	0			9
		9			

Second Year

Third Term			Fourth Term		
71.103	Manufacturing Pharmacy III	2	71.104	Manufacturing Pharmacy IV	2
71.113	New Product Development III	2	71.114	New Product Development IV	2
	Electives	5		Electives	5
71.131	Seminar	0	71.132	Seminar II	0
		9			9

Electives

14.220	Statistics	2
14.230	Probability	2
72.103	Medicinal Chem. Advanced III	2
72.104	Medicinal Chem. Advanced IV	2
72.121	Drug Analysis, Advanced	2
73.101	Pharmacology, Advanced I	2
73.102	Pharmacology, Advanced II	2
73.103	Pharmacology, Advanced III	2
73.104	Pharmacology, Advanced IV	2
73.121	Biochemistry, Advanced I	2
73.122	Biochemistry, Advanced II	2
73.131	Toxicology	2
73.151	Pharmacological Electronics	2
73.161	Drug Metabolism	2
73.171	Bionucleonics	1
73.181	Antibiotics	2
73.191	Biologicals and Allergens	2
11.63	Physical Chemistry III	3
11.64	Physical Chemistry IV	3

Medicinal Chemistry

MASTER OF SCIENCE DEGREE

Admission

To be considered for graduate work in Medicinal Chemistry, applicants must have obtained a Bachelor of Science degree in Pharmacy from a College or Pharmacy accredited by the American Council on Pharmaceutical Education.

Prerequisites for classification as regular student: Satisfactory completion of a course in Differential and Integral Calculus at an acceptable institution.

Full-time Day Program on Co-operative Plan

The Graduate Program in Medicinal Chemistry operates on the Co-operative Plan as described on the page preceding the Academic Calendar. A minimum of 36 semester credit hours of instruction is required for the degree. These credit hours will normally be distributed over four terms according to the following pattern:

First Year

First Term				Second Term		
72.101	Medicinal Chem., Advanced I	2		72.102	Medicinal Chem., Advanced II	2
73.121	Biochemistry, Advanced I	2		73.122	Biochemistry, Advanced II	2
11.61	Physical Chem. I (or Electives)	3		11.62	Physical Chem; II (or Electives)	3
11.57	Qualitative Organic Chem.	2		11.58	Organic Preparations	2
71.121	Pharmaceutical Literature	0				9
		9				

Second Year

Third Term				Fourth Term		
72.103	Medicinal Chem., Advanced III	2		72.104	Medicinal Chem., Advanced IV	2
72.111	Drug Syntheses I	2		72.112	Drug Syntheses II	2
72.131	Radioactive Medicinals	2			Electives	5
	Electives	3		71.132	Seminar	0
71.131	Seminar I	0				9
		9				

Electives

14.220	Statistics	2	73.102	Pharmacology, Advanced II	2
14.230	Probability	2	73.103	Pharmacology, Advanced III	2
71.101	Manufacturing Pharmacy I	2	73.104	Pharmacology, Advanced IV	2
71.102	Manufacturing Pharmacy II	2	73.121	Biochemistry, Advanced I	2
71.103	Manufacturing Pharmacy III	2	73.122	Biochemistry, Advanced II	2
71.104	Manufacturing Pharmacy IV	2	73.131	Toxicology	2
71.111	New Product Development I	2	73.151	Pharmacological Electronics	2
71.112	New Product Development II	2	73.161	Drug Metabolism	2
71.113	New Product Development III	2	73.171	Bionucleonics	1
71.114	New Product Development IV	2	73.181	Antibiotics	2
72.121	Drug Analysis, Advanced	2	73.191	Biologicals and Allergens	2
73.101	Pharmacology, Advanced	2	11.63	Physical Chemistry III	3
			11.64	Physical Chemistry IV	3

Pharmacology

MASTER OF SCIENCE DEGREE

Admission

To be considered for graduate work in Pharmacology, applicants must have obtained a Bachelor of Science degree in Pharmacy from a College of Pharmacy accredited by The American Council on Pharmaceutical Education or they must be graduates in other Life Sciences from accredited colleges, universities, or institutes of technology.

Prerequisite for classification as regular student: Satisfactory completion of a course in Differential and Integral Calculus at an acceptable institution.

Full-time Day Program on Co-operative Plan

The Graduate Program in Pharmacology operates on the Co-operative Plan as described on the page preceding the Academic Calendar. A minimum of 36 semester credit hours of instruction is required for the degree. These credit hours will normally be distributed over four terms according to the following pattern:

First Year

First Term			Second Term		
73.101	Pharmacology, Advanced I	2	73.102	Pharmacology, Advanced II	2
73.111	Pharmacological Methodology I	1	73.112	Pharmacological Methodology II	1
73.121	Biochemistry, Advanced I	2	73.122	Biochemistry, Advanced II	2
14.230	Probability	2	14.220	Statistics	2
11.61	Physical Chem. I (or Electives)	3	11.62	Physical Chem. II (or Electives)	3
71.121	Pharmaceutical Literature	0			10
		10			

Second Year

	Third Term			**Fourth Term**	
73.103	Pharmacology, Advanced III	2	73.104	Pharmacology, Advanced IV	2
73.113	Pharmacological Methodology III	1	73.114	Pharmacological Methodology IV	1
73.161	Drug Metabolism	2	73.131	Toxicology	2
73.171	Bionucleonics	1	73.141	Toxicol. Methodol.	1
	Electives	2	73.151	Pharmacological Electronics	2
71.131	Seminar	0	71.132	Seminar II	0
		8			8

Electives

71.111	New Product Development I	2	73.191	Biologicals and Allergens	2
72.101	Medicinal Chem., Advanced I	2	10.63	Cellular and Comparative Physiology I	3
72.102	Medicinal Chem., Advanced II	2	10.64	Cellular and Comparative Physiology II	3
72.103	Medicinal Chem., Advanced III	2	10.65	Genetics I	3
72.104	Medicinal Chem., Advanced IV	2	10.66	Genetics II	3
10.55	Comparative Vertebrate Anat.	3	10.69	Histological Technique I	2
10.56	Comparative Vertebrate Anat. I	3	10.70	Histological Technique II	2
10.59	Animal Histology I	3	11.63	Physical Chemistry I	3
10.60	Animal Histology II	3	11.64	Physical Chemistry II	3
73.181	Antibiotics	2			

DESCRIPTION OF COURSES

All courses carry two semester hour credits unless specified otherwise.

71.101   Manufacturing Pharmacy I   Prep. Admission to
                                                      Graduate Program

Study, theory and operation of various types of equipment for tablet manufacture, including mixers, blenders, reduction mills, sifting apparatus and tablet-compression equipment. 3 Cl.; 3 Lab.

(Offered yearly, 1st term)

71.102   Manufacturing Pharmacy II   Prep. Admission to
                                                      Graduate Program

Spray drying, fluidized bed transfers and various kinds of tablet coating equipment. 3 Cl.; 3 Lab.   (Offered yearly, 2nd term)

71.103   Manufacturing Pharmacy III   Prep. Admission to
                                                      Graduate Program

Ointment production and milling apparatus, colloid mills, agitators, mixers, stirrers, blenders, heating and drying equipment. 3 Cl., 3 Lab.
(Offered yearly, 1st term, starting 1965)

71.104   Manufacturing Pharmacy IV   Prep. Admission to
                                                      Graduate Program

Equipment for the production of parenteral and aerosol products. Packaging and labeling devices, tablet counters, and industrial testing equipment. Modifying equipment for special purposes. 3 Cl.; 3 Lab.
(Offered yearly, 2nd term, starting 1966)

71.111   New Product Development I   Prep. Admission to
                                                      Graduate Program

Development of compressed dosage forms, including multi-layer, inlay type, compression coated, timed-release, sustained action, and molded tablets. Testing equipment for the determination of disintegration and dissolution rates. 3 Cl.; 3 Lab.   (Offered yearly, 1st term)

71.112   New Product Development II   Prep. Admission to
                                                      Graduate Program

Development of granulations, powders, and capsules for short or prolonged action. Spray drying. Tablet coating techniques (film, air suspension, and wet coating). 3 Cl.; 3 Lab. (Offered yearly, 2nd term)

71.113   New Product Development III   Prep. Admission to
                                                      Graduate Program

Parenterals, liquids, suspensions, colloids, and emulsions. Sedimentation and settling studies. Investigation of new types of stabilizing and suspending agents. 3 Cl.; 3 Lab.

(Offered yearly, 1st term, starting 1965)

71.114   New Product Development IV   Prep. Admission to
                                                        Graduate Program
Formulation of aerosols, suppositories, ointments, and creams including cosmetics. Flavoring and coloring of various dosage forms and preparations. Stability testing of pharmaceutical products and containers.
3 Cl.; 3 Lab.   (Offered yearly, 2nd term, starting 1966)

71.121   Pharmaceutical Literature   Prep. Admission to
                                                        Graduate Program
Methods of searching scientific literature in chemistry, physical chemistry, pharmacology and therapeutics. Essentials for writing concise and readable scientific reports and lectures. Methods of writing patent applications. Food and Drug Act (FDA) and its requirements for writing labels, package inserts, and screening of advertising copy. FDA requirements regarding pharmacological and clinical testing of new drugs. Instructions on the writing of New Drug Applications (NDA). Basic medical terminology as needed by pharmacists for selling, detailing or advertising pharmaceuticals. 2 Cl.   (Offered yearly, 1st term)

71.131   Seminar I   Prep. Admission to Graduate Program
Lectures on selected topics in the life sciences. These reports will be made by the graduate students, the faculty members or invited guests. Students will present results of their experimental research or literature studies. Topics for the graduate students are selected with the assistance of a faculty member and the reports will be submitted in written form for evaluation. 2 Cl.   (Offered yearly, 1st term, starting 1965)

71.132   Seminar II   Prep. 71.131 Seminar I
Continuation of lectures on selected topics in the life sciences. At frequent intervals, discussion of newly marketed single drugs. 2 Cl.
                                  (Offered yearly, 2nd term, starting 1966)

72.101   Medicinal Chemistry, Advanced I   Prep. 11.28 Organic
                                          Chem. or equivalent and 72.06 Organic
                                                      Medicinals or equivalent
Relationships between molecular architecture, pharmacologic and toxicologic action. Selected drug syntheses. Emphasis on drugs in the fields of mental health and cardiovascular diseases. 3 Cl.
                                                   (Offered yearly, 1st term)

72.102   Medicinal Chemistry, Advanced II   Prep. 72.101
                                          Medicinal Chemistry, Advanced I
Principles of design of new molecules with potential therapeutic action. Problems in chemical syntheses. Emphasis on diuretics, hormones, antimetabolites and antineoplastic agents. 3 Cl.
                                                  (Offered yearly, 2nd term)

72.103   Medicinal Chemistry, Advanced III   Prep. 72.102
Medicinal Chemistry, Advanced II
Synthesis of selected drugs of recent clinical importance. Mechanism of drug action, enzyme inhibition and drug latentation. 3 Cl.
(Offered yearly, 1st term)

72.104   Medicinal Chemistry, Advanced IV   Prep. 72.103
Medicinal Chemistry, Advanced III
Selected topics related to current advances in medicinal chemistry. Continuation of I, II, and III in illustrative and summary approach. 3 Cl.   (Offered yearly, 2nd term)

72.111   Drug Syntheses I   Prep. 11.58
Organic Preparations or equivalent
Chemical synthesis of selected modern drugs. 9 Lab.
(Offered yearly, 1st term, starting 1965)

72.112   Drug Syntheses II   Prep. 72.111 Drug Syntheses I
Continuation of 72.111. 9 Lab.
(Offered yearly, 2nd term, starting 1966)

72.121   Drug Analysis, Advanced   Prep. 11.62
Physical Chemistry II or equivalent
Current methods used in the analysis of drugs and drug products, with particular emphasis on instrumental methods; potentiometric titrations, visible, ultraviolet, and infrared spectrophotometry, and fluorometry. Paper, column and thin-layer chromatographic methods of analysis are included. 2 Cl.; 3 Lab.   (Offered yearly, 2nd term, starting 1966)

72.131   Radioactive Medicinals   Prep. 73.171 Bionucleonics and
11.58 Organic Preparations
Synthesis of selected drugs bearing one or more radioactive element. Principles and practices of safe handling radioactive materials are emphasized. 2 Cl.; 3 Lab.   (Offered yearly, 1st term, starting 1965)

73.101   Pharmacology, Advanced I   Prep. 73.11
Pharmacology or equivalent
Principles and mechanisms underlying the mode of action of drugs; concepts basic to drug evaluation, including experimental design, tests of significance, and drug interaction. Action of drugs upon the central nervous system. Part 1. 3 Cl.   (Offered yearly, 1st term)

73.102   Pharmacology, Advanced II   Prep. 73.101
Pharmacology, Advanced I
Action of drugs upon the central nervous system, Part II; peripheral effector mechanisms. 3 Cl.   (Offered yearly, 2nd term)

73.103　Pharmacology, Advanced III　　　　Prep. 73.102
Pharmacology, Advanced II
Cardiovascular agents; diuretics; antispasmodics; antihistamines. 3 Cl.
(Offered yearly, 1st term)

73.104　Pharmacology, Advanced IV　　　　Prep. 73.103
Pharmacology, Advanced III
Chemotherapeutic agents; pharmacological aspects of immunity and allergy; endocrinological agents; drugs in nutrition and obesity; drugs affecting blood and blood-forming centers. 3 Cl.
(Offered yearly, 2nd term)

73.111　Pharmacological Methodology I　　　　Prep. 73.11
Pharmacology or equivalent
Evaluation of central-nervous-system (CSN) depressants, Part I. 3 Lab.;
Cr. Hrs. 1　　　　(Offered yearly, 1st term)

73.112　Pharmacological Methodology II　　　　Prep. 73.111
Pharmacological Methodology I
Evaluation of CNS-depressants, Part II; CNS-stimulants. 3 Lab.; Cr.
Hrs. 1.　　　　(Offered yearly, 2nd term)

73.113　Pharmacological Methodology III　　　　Prep. 73.112
Pharmacological Methodology II
Evaluation of cardiovascular and autonomic drugs; diuretics. 3 Lab.;
Cr. Hrs. 1.　　　　(Offered yearly, 1st term)

73.114　Pharmacological Methodology IV　　　　Prep. 73.113
Pharmacological Methodology, III
Experimental hypersensitivity; bronchodilators; antihistamines. 3 Lab.;
Cr. Hrs. 1.　　　　(Offered yearly, 2nd term)

73.121　Biochemistry, Advanced I　　　　Prep. 73.06
Biochemistry or equivalent
Topochemistry of the cell, significance of the compartments, special biochemical functions of certain organs and correlations in intermediary metabolism. 2 Cl.; 3 Lab.　　　　(Offered yearly, 1st term)

73.122　Biochemistry, Advanced II　　　　Prep. 73.121
metabolic abnormalities, human heredity, and its biochemical origins.
Biochemistry, Advanced I
The metabolic basis of inherited diseases including inherited variation,
2 Cl.; 3 Lab.　　　　(Offered yearly, 2nd term)

73.131 Toxicology
Prep. 73.11
Pharmacology or equivalent

Mechanisms through which drugs interfere with life processes, including teratogenesis; concepts of "drug safety" in relationship to requirements of the Food and Drug Administration for acute, subacute, and chronic toxicity; biometrical procedures for estimating drug toxicity. 3 Cl.

(Offered yearly, 2nd term, starting 1966)

73.141 Toxicological Methodology
Prep. 73.11
Pharmacology or equivalent

Application of principles outlined in 73.131. 3 Lab.

(Offered yearly, 2nd term, starting 1966)

73.151 Pharmacological Electronics
Prep. 73.103
Pharmacology, Advanced III

Electronic principles to understand electronic circuits and instruments used in biological, physical and chemical evaluations. Power supplies, active devices (vacuum tube, transistors, diodes, gas tubes), output devices (oscilloscopes, memoscopes, recorders, mechanical and electrical counters), amplification methods, transducers (mechanical, temperature, magnetic, electromagnetic radiation, radiation), servo system. 3 Cl.; 3 Lab.   (Offered yearly, 2nd term, starting 1966)

73.161 Drug Metabolism
Prep. 73.122
Biochemistry, Advanced II

Action of biological systems upon chemical agents of pharmacologic importance. General principles and mechanisms of metabolic transformations and excretion of these agents. 3 Cl.

(Offered yearly, 1st term, starting 1965)

73.171 Bionucleonics
Prep. 11.04
General Chemistry or equivalent

Selected aspects of the theoretical background of isotopic tracer methodology. Laboratory techniques and biological applications. 2 Cl.; 3 Lab.; Cr. Hrs. 1.   (Offered yearly, 2nd term, starting 1966)

73.181 Antibiotics   Prep. 11.28 Organic Chemistry or equivalent
74.04 Pharmaceutical Microbiology or equivalent
74.02 Pharmacognosy or equivalent

More prominent and newer antibiotics, with emphasis on their natural sources, isolation, methods of cultivation and commercial production, including purification and testing methods, and their pharmaceutical preparations and therapeutic applications. 3 Cl.

(Offered yearly, 1st term, starting 1965)

73.191   Biologicals and Allergens   Prep. 74.04 Pharmaceutical
Microbiology or equivalent
74.02 Pharmacognosy or equivalent
The more recent biologicals, their production and immunological values.
Allergens, their sources, production and practical applications. 3 Cl.
(Offered yearly, 2nd term, starting 1966)

76.101   General Hospital Administration I   Prep. Admission
to Graduate Program
Planning of requirements in the medical care, maintenance, food and
pharmaceutical contracts, construction, business administration and
manpower needs of the hospital. Supervision of the smooth operation
of personnel and of the School of Nursing. Contacts with co-operating
universities. Discussion of various health plans and liability insurances.
Co-ordination of all hospital departments. 2 Cl. Cr. Hrs. 1.

(Offered yearly, 1st term)

76.102   General Hospital Administration II   Prep. 76.101
General Hospital Administration I
Continuation of General Hospital Administration I. 2 Cl.
(Offered yearly, 1st term, starting 1965)

76.111   Hospital Pharmacy Administration I   Prep. Admission
to Graduate Program
Administration of Pharmacy Department in an institutional environment.
Planning of supplies. Selection of purchases. Medium scale production
of preparations for dispensing. Personnel management, public relations,
legal responsibilities, educational demands, professional communications
and general administrative functions of a hospital pharmacist. 2 Cl.;
Cr. Hrs. 1.   (Offered yearly, 2nd term)

76.112   Hospital Pharmacy Administration II   Prep. 76.111
Hospital Pharmacy Administration I
Continuation of Hospital Pharmacy Administration I. 2 Cl.; Cr. Hrs. 1.
(Offered yearly, 2nd term, starting 1966)

GIFTS AND BEQUESTS

Northeastern University will welcome gifts for the following purposes:

(a) For its building program.

(b) For general endowment.

(c) For specific purposes which may especially appeal to the donor.

It is suggested that, when possible, those contemplating gifts or bequests confer with the President of the University regarding the University's needs before legal papers are drawn.

The legal name of the University is "Northeastern University." However, in the making of gifts and bequests to Northeastern, the following wording is suggested: "Northeastern University, an educational institution incorporated under the laws of Massachusetts and located in Boston, Massachusetts."

NORTHEASTERN UNIVERSITY

COLLEGES OPERATING ON THE CO-OPERATIVE PLAN

College of Liberal Arts

Offers full-time day curricula in science and non-science fields leading to the degree of Bachelor of Arts.

Affiliated Programs:

For medical technologists—Offers full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Arts, in co-operation with the New England Baptist and the New England Deaconess Hospitals.

For dental hygienists—Offers curricula, in affiliation with the Forsyth School for Dental Hygienists, leading to the degree of Associate in Science.

For nurses—Offers instruction in the sciences, humanities, and social studies for student nurses from the Peter Bent Brigham, New England Deaconess, and Children's Hospital Medical Center Schools of Nursing.

College of Education

Offers full-time day curricula leading to the degree of Bachelor of Science in Education in preparation for teaching or administrative positions in elementary and secondary schools.

College of Business Administration

Offers full-time day curricula leading to the degree of Bachelor of Science in Business Administration.

Center for Management Development—Offers executive-development programs based on the principles of Co-operative Education designed to help men in middle-management positions to grow professionally. Courses are conducted at Phillips Academy, Andover, Massachusetts.

Bureau of Business and Economic Research—Conducts basic research in areas of business and industry, particularly with reference to the New England economy.

College of Engineering

Offers full-time day curricula in civil, mechanical, electrical, chemical, and industrial engineering and a part-time evening program, both leading to the degree of Bachelor of Science in Engineering.

College of Pharmacy

Offers full-time day curricula leading to the degree of Bachelor of Science in Pharmacy.

College of Nursing

Offers full-time, three-year curricula leading to the Associate Degree, and prepares candidates for the R.N. Examinations.

Boston-Bouvé College of Physical Education and Physical Therapy

Offers full-time day curricula on the Co-operative Plan leading to the degrees of Bachelor of Science in Physical Education and Bachelor of Science in Physical Therapy.

For further information
regarding any of the above colleges, address

Dr. Gilbert C. Garland, Dean and Director of Admissions
NORTHEASTERN UNIVERSITY
360 Huntington Avenue, Boston, Massachusetts 02115
Telephone 262-1100

NORTHEASTERN UNIVERSITY

Graduate Division

Actuarial Science—Offers a program leading to the degree of Master of Science in Actuarial Science.

Arts and Sciences—Offers programs leading to the degrees of Master of Arts and Master of Science, and to Ph.D. degrees in Physics and Chemistry.

Business—Offers evening programs leading to the degree of Master of Business Administration.

Education—Offers late afternoon, evening, and Saturday morning programs leading to the degree of Master of Education.

Engineering—Offers programs leading to the degree of Master of Science with course specification and to Ph.D. degrees in the fields of Electrical and Chemical Engineering.

Pharmaceutical Sciences—Offers programs leading to the Master of Science degree with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

University College

Offers part-time evening programs in various fields of business and the liberal arts designed especially to meet the needs of employed personnel and leading to the Bachelor of Science degree or to appropriate associate degrees.

Department of Law Enforcement and Security—Offers part-time evening programs leading to the degree of Bachelor of Science in the field of Law Enforcement and Security.

The New England Police Institute, in co-operation with the New England Association of Chiefs of Police and the Massachusetts Chiefs of Police Association, conducts special short-term, non-degree programs and seminars.

Lincoln College

Offers part-time evening curricula in science and in engineering technology leading to the degrees of Associate in Science and Associate in Engineering.

Center for Continuing Education

Provides special programs and services for the business and industrial community through seminars, conferences, institutes, and forums, and a wide variety of special courses. These programs are conducted either on the Huntington Avenue campus or at Henderson House, the University's suburban conference center.

Bureau of Business and Industrial Training—Offers both on-campus and off-campus, short-term, non-credit courses to meet the specific training needs of industrial organizations in New England.

Suburban Campus

Offers courses in both the graduate and undergraduate programs of the University at Burlington, Massachusetts.

For further information
regarding any of the above schools, colleges or departments, address
the respective deans or directors.

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